Coal Age

AUGUST, 1955

A McGRAW-HILL PUBLICATION—PRICE 50c

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How principles of centralized automatic lubrication are applied in servicing strip-mine haulage units. p 60

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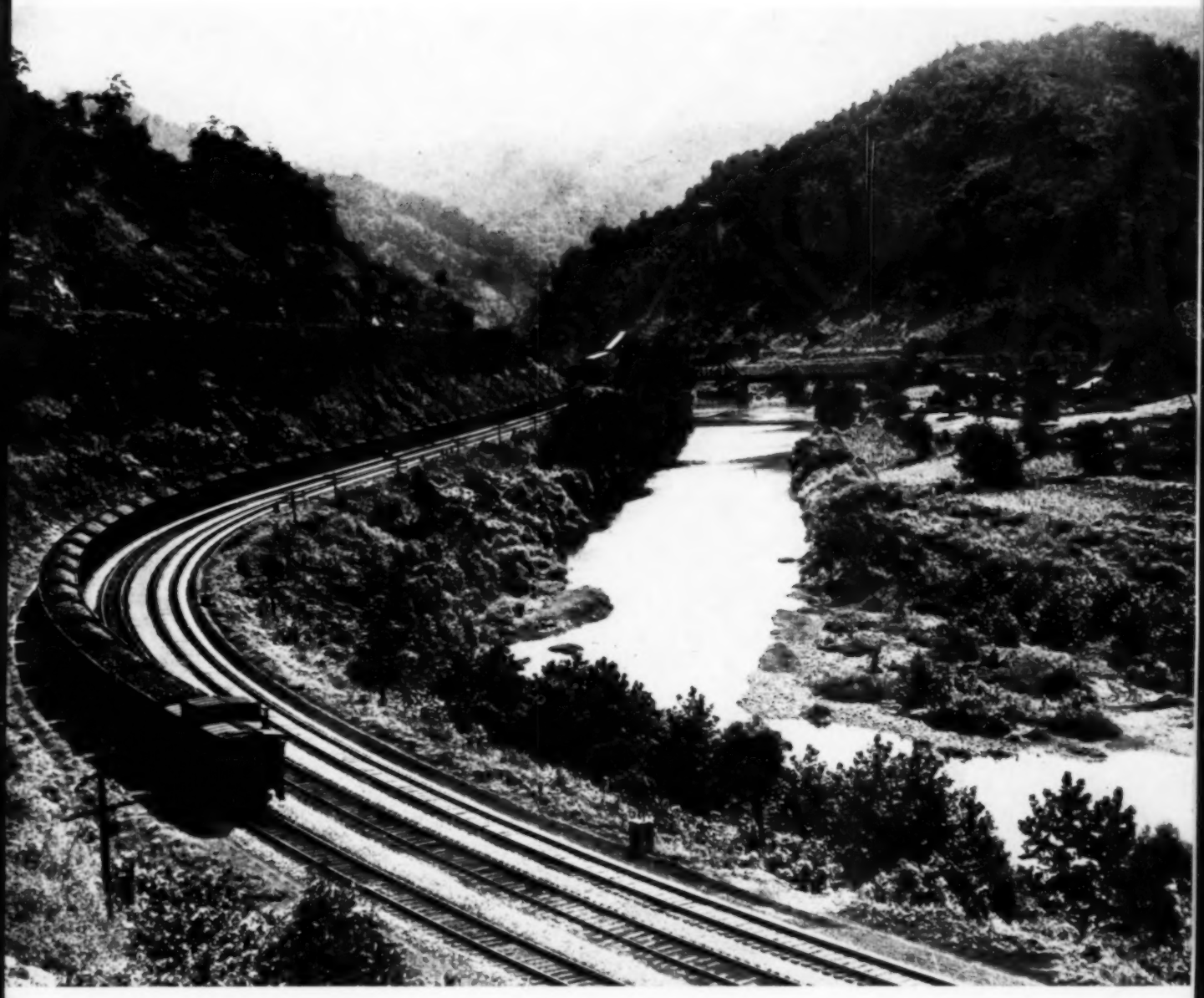

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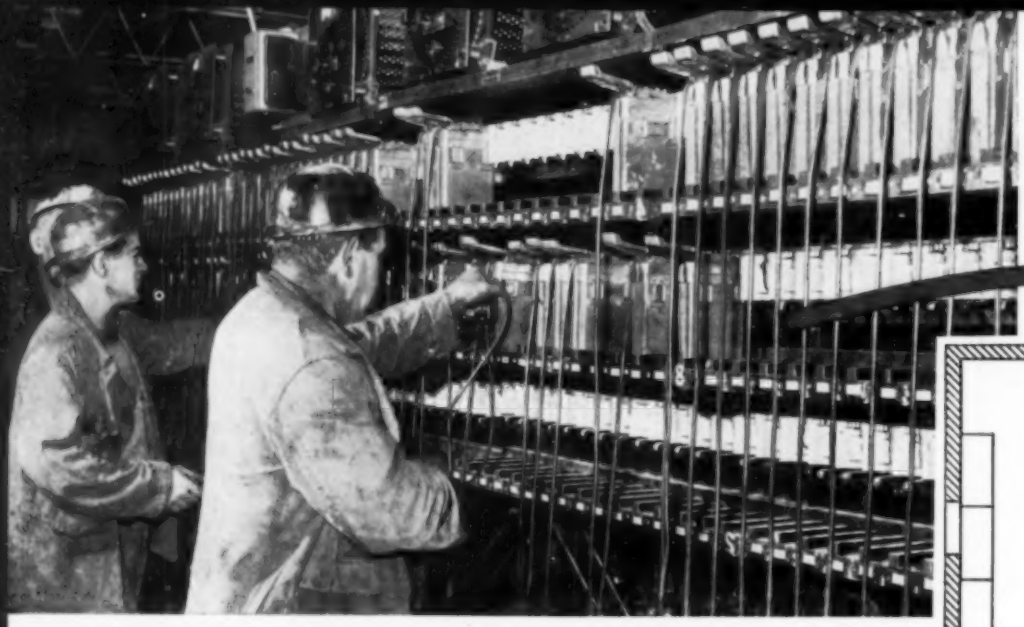

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The Edison Battery stays on the job

Because light is only as dependable as the battery that provides the power, battery service life is the only answer to performance. The Edison R-4 Battery does not destroy itself to function . . . does not deteriorate when not in service . . . gives you the most dependable light shift-after-shift, for years. Write for complete details.

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One of the important advantages of our long-time experience with Edison Self-Service is the know-how it has given our Service Engineers in sizing-up a mine's lamphouse needs, then designing or modifying a lamproom layout to provide the fastest traffic flow, in and out. And the advantages of proper and efficient lamproom arrangement go beyond efficient moving of the miners—proper lamp care is easier and that means you get better, more dependable light underground. Your miners work better, safer.

You'll find it profitable to investigate Edison Self-Service. Just write or call.

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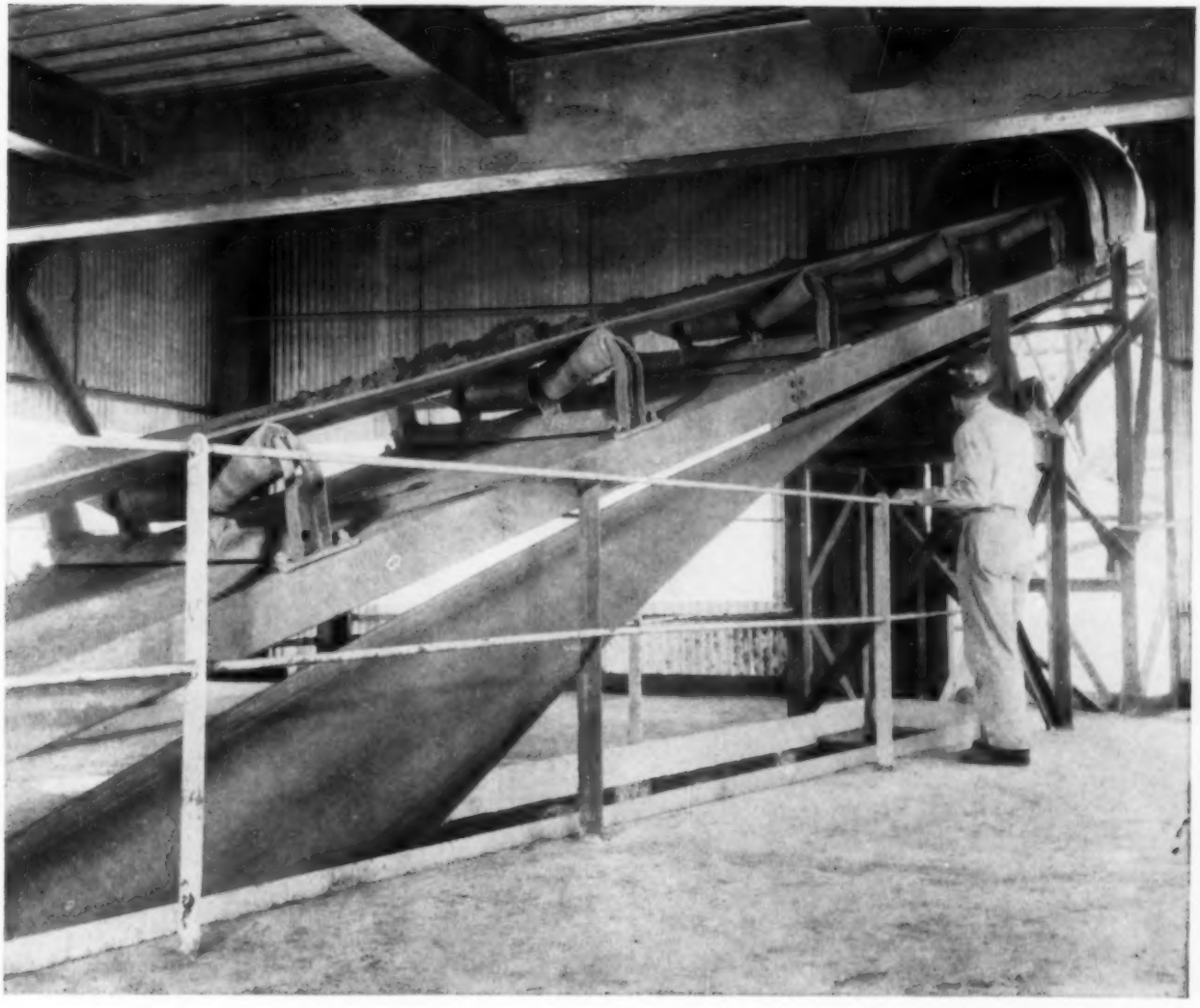
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



How conveyors stay clean even when load is sticky

THAT stuff riding the conveyor belt is refuse from a coal washing plant on its way to a dumping point—550 feet uphill. When plans were drawn up, engineers said the usual conveyor system wouldn't be the answer here. They knew the wet clay and sticky sand would cling to the belt, build up into gummy layers, clog the return idlers and pulleys, and damage the belt cover.

To avoid this trouble, they installed something quite different in conveyors—the B. F. Goodrich "Turnover" belt system. Here's how it works. As the material is dumped off the end of the moving belt, the belt makes a 180° turn, runs empty along the return idlers, then makes another one-half turn (as shown above) before receiving the next load.

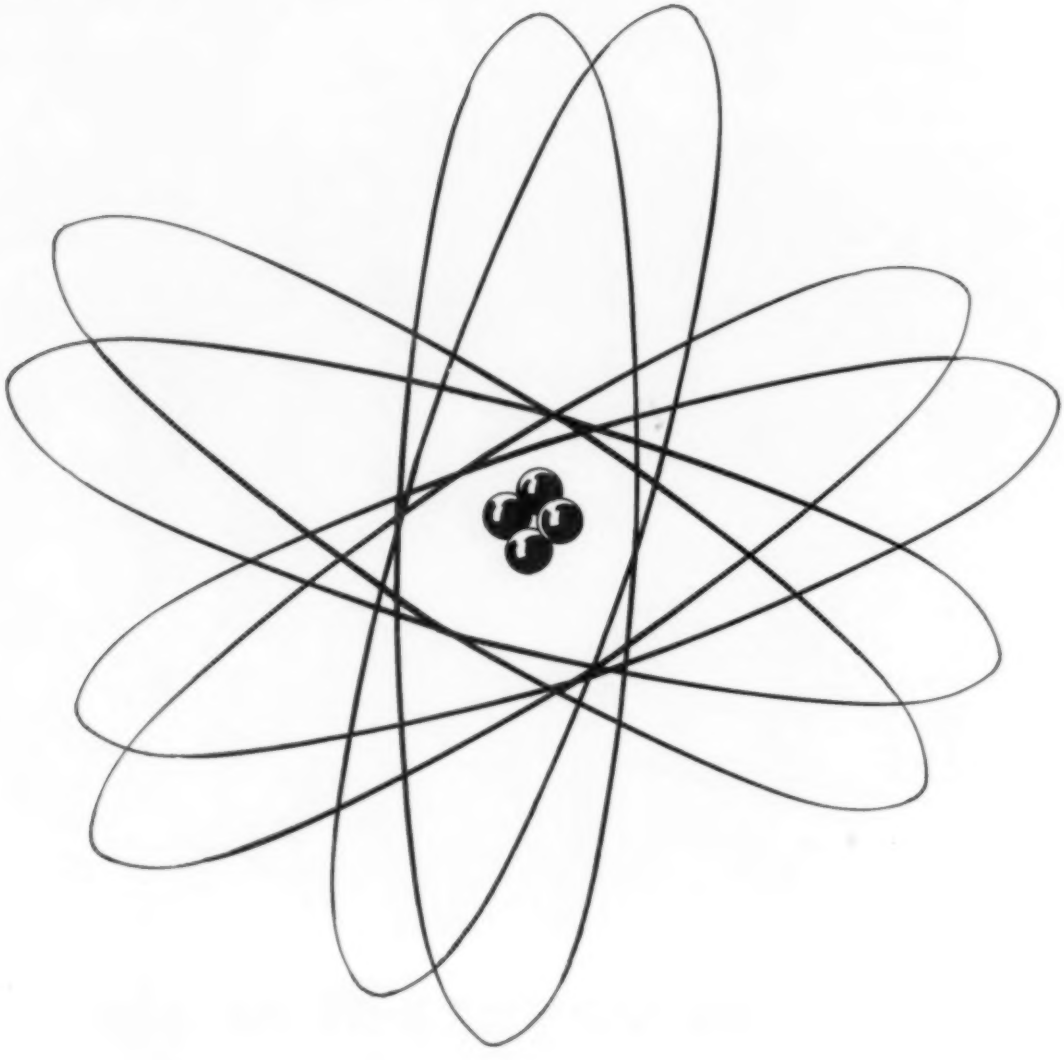
Only the clean side of the belt touches the idlers, so there's no chance for sticky materials to build up on them. Even wet materials can be handled in cold weather without danger of the belt freezing to the rotating metal parts.

With the "Turnover" belt, expensive decking can be eliminated. Clean up of spillage is no problem because any material that falls on the lower run of the belt is carried to the end and dumped off when the belt makes its turn. Damage to belt body is reduced because lumps of materials cannot be trapped between the belt and pulleys.

If you have an operation where sticky, freezing or corrosive materials must be moved from place to place, the B. F. Goodrich "Turnover" conveyor system can save you trouble and money. Your B. F. Goodrich distributor can give you full details and show you how easy it is to convert any conventional system into the turnover type. *The B. F. Goodrich Company, Dept. M-462, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

Your Key to Tomorrow



Atomic power holds the key to the future, for creation or obliteration, as man may decide. But in the meanwhile, ordinary occupations must go ahead . . . coal mining equipment must be kept in good operating condition. The key to the "future" of this equipment is LUBRICATION, and the choice of the right lubricants is not only in your hands, but has been clearly indicated by modern practice.

HULBURT OIL & GREASE COMPANY

PHILADELPHIA, PA.

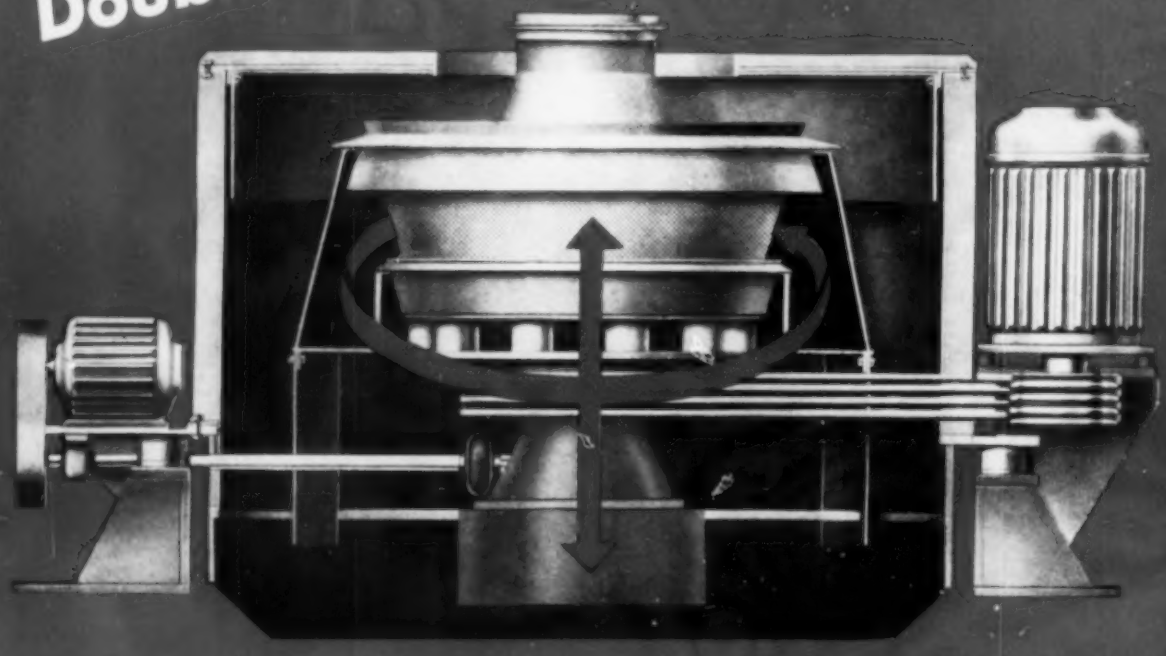
Specialists in Coal Mine Lubrication

is Here TODAY . . .

Hulburt
QUALITY LUBRICANTS

TODAY the mining machines in which you've invested hundreds of thousands of dollars may be "earning their keep" economically—but what about their future? The best protection for that future is not only lubrication, BUT the RIGHT LUBRICANTS. That means HULBURT QUALITY LUBRICANTS, if the experience of many mines and many years is to be trusted. Even when machines are powered atomically—there'll still be a vital need for HULBURT.

Double-Action DRIES FINE COAL AT HALF THE COST



HOW IT WORKS

The tapered screen basket through which the fine coal passes is rotated, producing a centrifugal force which throws out the moisture. At the same time the basket is given an oscillating up-and-down motion subjecting the solids to a gentle shaking action as they move up and across the screen surface. The result is an evenly distributed porous layer of solids in which the particles are constantly shifting their relative position permitting the moisture to escape. Vibration is minute and completely isolated from the machine foundation.

BIRD-HUMBOLDT CENTRIFUGAL DRYER

Unlike many fine coal dryers where relatively violent separating action eats up power and chews up screens, the Bird-Humboldt Dryer treats the coal to a gentle double-action which, ton for ton, takes much less power and keeps screens effective for *weeks* instead of *days*.

This unique *oscillating* plus *rotating* action enables the Bird-Humboldt Dryer to deliver 80 tons of coal with a 30 HP drive. 97 to 98 per cent of the coal is recovered and it comes out low in moisture content. There is almost no degradation.

Investigate this new way to dewater fine coal *better* at *half* the operating and maintenance cost. Write for new bulletin containing detailed information.

BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS
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Coal Age

AUGUST • 1955

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72 Men, 1,300 Tpd

Modern equipment and methods and high efficiency are not confined to large mines only. Next month in *Coal Age* the operations of the Reppert Fairmont Coal Co., at Buckhannon, W. Va., will be featured. This all-belt mine uses up-to-date face methods and total cleaning in producing a clean, uniform utility coal from the Redstone seam.

Aberdeen Angus Project

Animal husbandry and mining engineering are fast becoming complementary professions. Pittsburg & Midway Coal Mining Co. now maintains a herd of registered Aberdeen-Angus cattle on reclaimed stripped land in southeastern Kansas. Sweet clover and "Korean" lespedeza flourish in the spoil areas, providing excellent fare for the valuable stock. Don't miss the pictures of "Champion" animals reared on stripped-over land.

Plastic Planks

Another problem solved! Lehigh Valley Coal Co., Wilkes-Barre, Pa., replaced springboards on screens and shakers with plastic-and-fabric boards to eliminate the costs of replacement boards and maintenance labor. Read about this latest twist in applying new materials to coal's jobs in the September issue.

Training Mission

How one company removed some of the kinks from machinery maintenance through the use of a well-planned training effort is the subject of another *Coal Age* offering in September. First, the instructor went to school to brush up on his teaching techniques. Then, the bosses and mechanics received valuble training on keeping machines running and clearing troubles in a hurry.

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Texaco Olympian Grease has outstanding resistance to oxidation and does not separate. It forms

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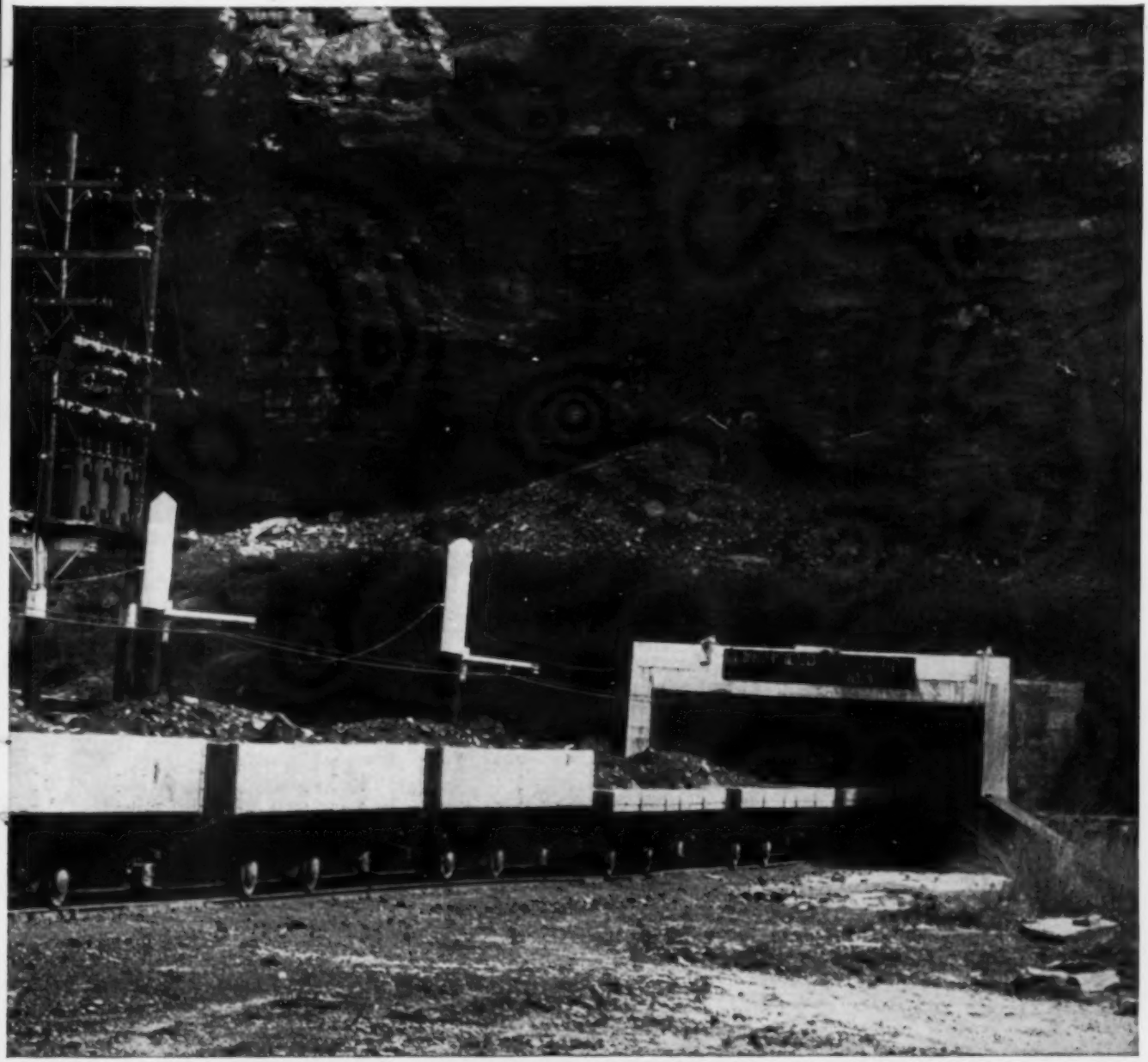
To get maximum protection for grease-lubricated high-speed ball and roller bearings, lubricate with *Texaco Regal Starfak*. This premium-quality lubricant stays *in* the bearings, checks wear, lasts longer.

Texaco Lubrication Engineers have the know-how to help you get more efficiency and economy throughout your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

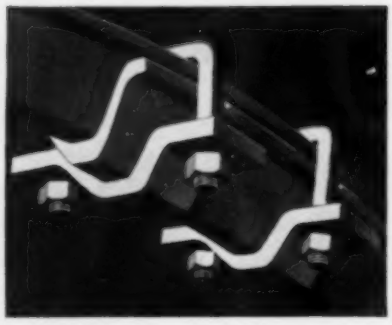


LUBRICANTS for the Coal Mining Industry

Steel Arch Offers New Kind of Safety Underground

Framing these men as they push the completion of a new ore mine is Bethlehem's Yieldable Arch for mine-roof control. It is especially designed to give rather than deform under excessive pressures. This allows the surrounding strata to stabilize naturally, and contributes to safety underground.

The yielding action takes place at sliding joints, where the nestable segments are joined to form the arch. The drawing at right illustrates how the rolled U-shaped segments nest at points of overlap. Studs on the sides of the segments locate the clamps and keep them positioned as the arch begins to yield.



Husky U-bolt clamps make the connections tightly enough to support normal loads. But when the load on the arch increases, the joints will yield, thus relieving the load while maintaining the structural integrity of the arch.

Horizontal struts and J-bolt clamps tie the arches together and provide lateral rigidity to the structure. Timber lagging may be used if desired, or steel lagging can be furnished.

The Yieldable Arch can be installed by your own men with minimum supervision, and it can be taken down and re-used time and again. It should pay for itself in its first year of operation. One of our engineers will be glad to discuss the Bethlehem Yieldable Arch and its advantages in detail with you. Just say the word.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

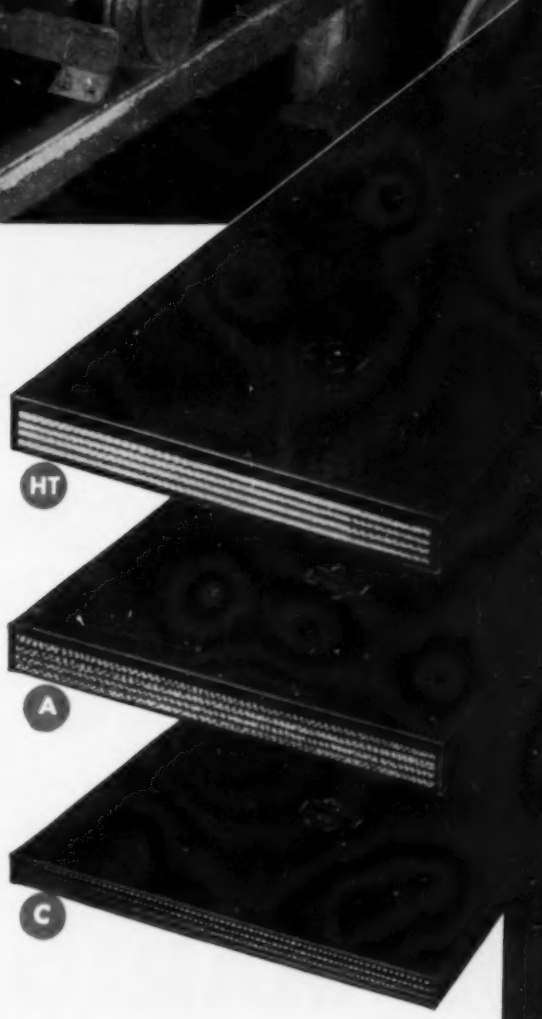
BETHLEHEM STEEL

BETHLEHEM STEEL

Thermoid Conveyor Belting cuts handling costs on rugged mining jobs

There's a Thermoid Conveyor Belt designed to lower your handling costs on every mining job. Here are three examples: HT —For extremely abrasive materials such as coal, granite, trap rock, flint rock, quartz ore; A —For slag, lime rock, crushed stone and other highly abrasive materials; C —For moderate abrasives such as sand, loam, soda, gravel.

Thermoid's exclusive impregnation process welds carcass and cover into an exceptionally strong, durable belt. Finest quality reinforcement and specially compounded rubber stocks assure long life . . . lower your handling costs per ton. Your Thermoid Distributor carries a complete line of Thermoid Conveyor Belting, Multi-V Belts and Hose to meet the most severe requirements of any mining operation. Call him or write direct for full information.



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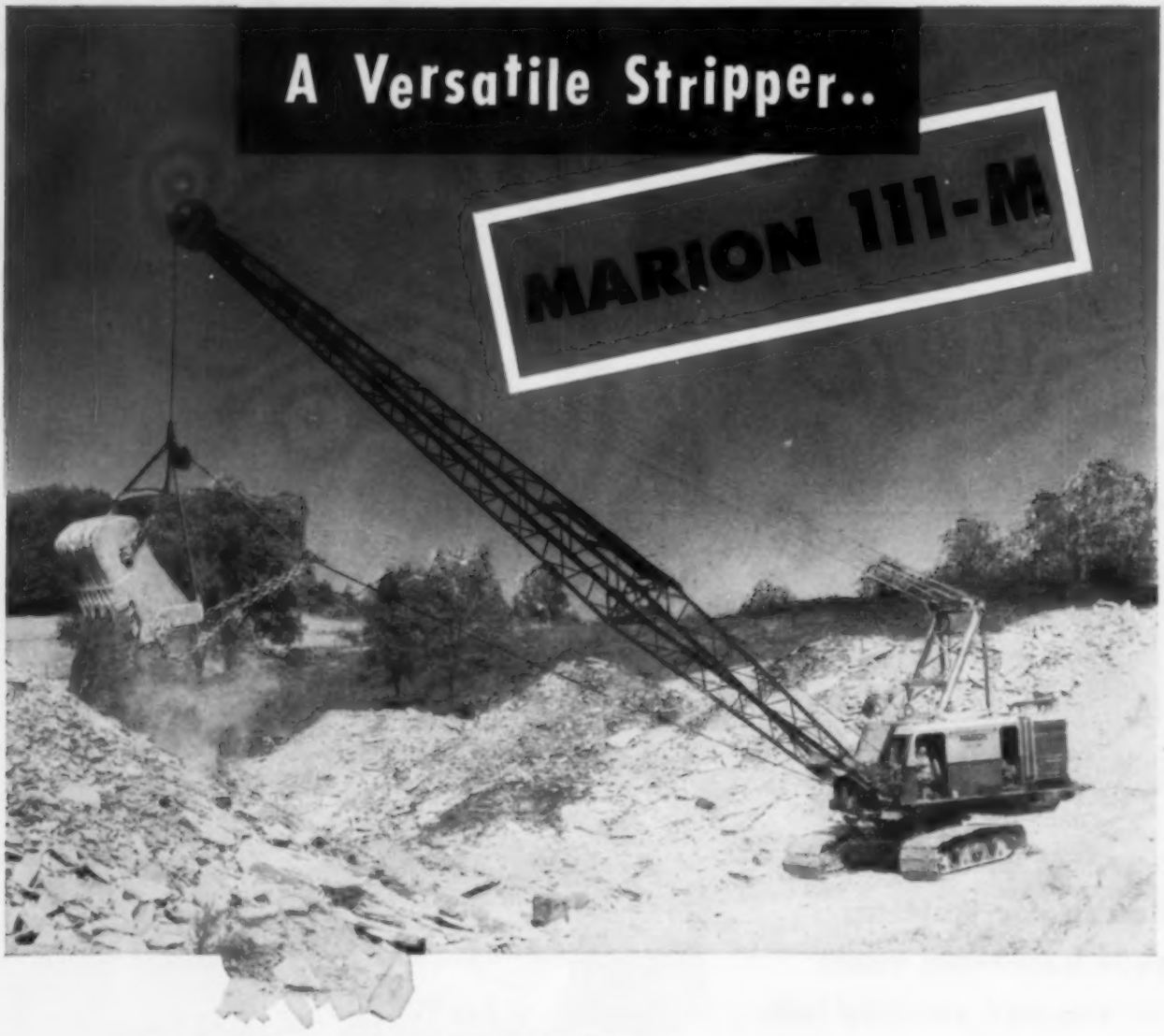

FIVE-YARD BITES Uncover 30-Inch Coal Vein in Ohio

This MARION 111-M dragline is stripping away 35 feet of gravel and rock to uncover a vein of coal ranging from 30 to 36 inches.

Its 5 cubic yard bites, with the help of the fast, cool swing of the 111-M, make steady progress. This 111-M is basically a diesel machine, but it has electric swing, which means speed and freedom from swing clutch problems.

Get more of the story about this strip mine and others in which MARION 111-M machines are playing an important part.

MARION / MARION POWER SHOVEL COMPANY
MARION, OHIO, U. S. A.

A Subsidiary of Merritt-Chapman & Scott Corporation

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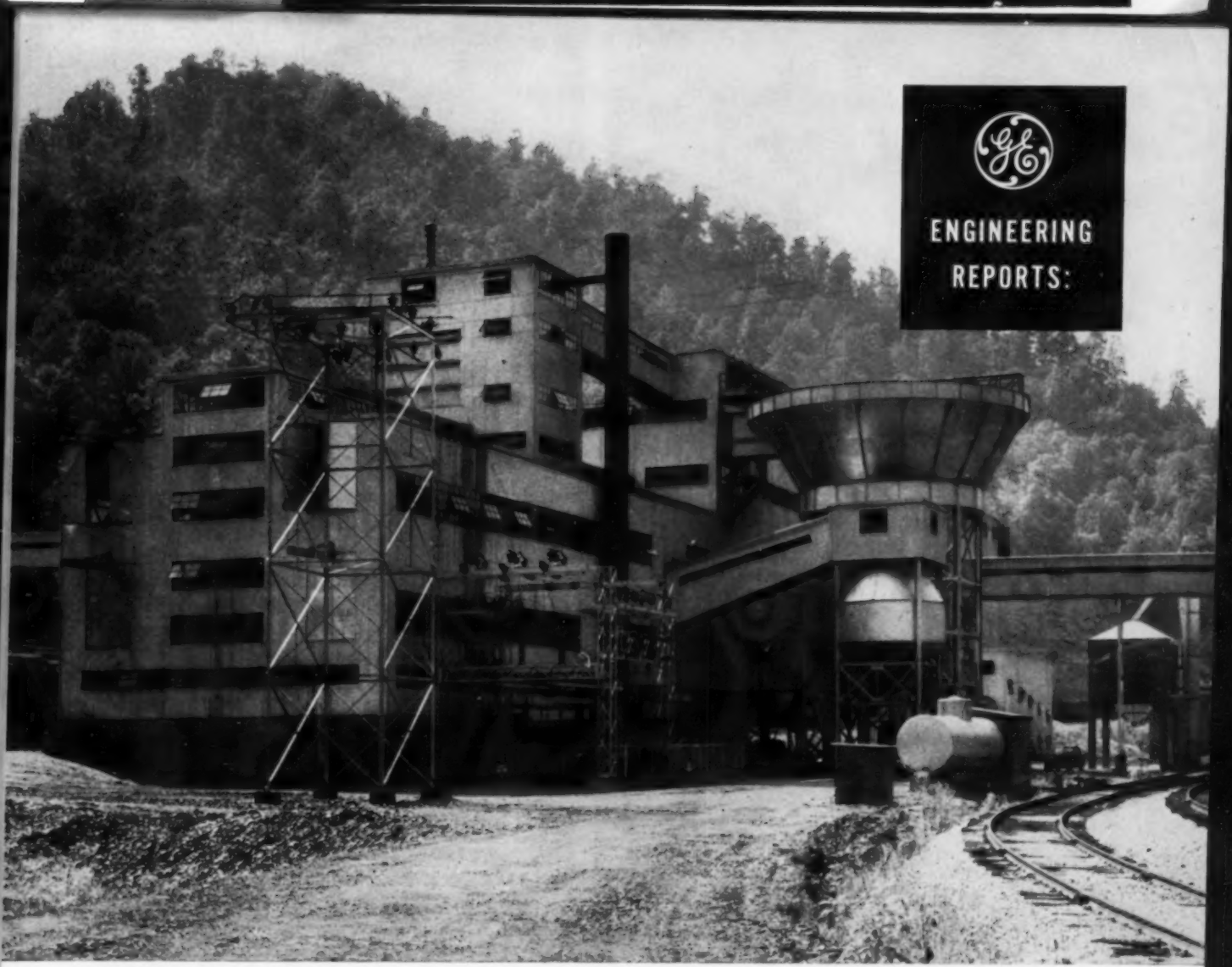

EASY-TO-EXPAND electrical systems are key feature of modern preparation plants which utilize G-E Engineering Services.

How G-E engineering services save time and money at coal preparation plants

Whether you are planning to modernize, expand, or build a new coal preparation plant, General Electric's complete range of engineering services will help save you time and money.

Working with you and/or your consulting engineers, these services will help:

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- **CUT INSTALLATION TIME.** Experienced G-E Field Engineers will help at the installation and start up of your electrical system.
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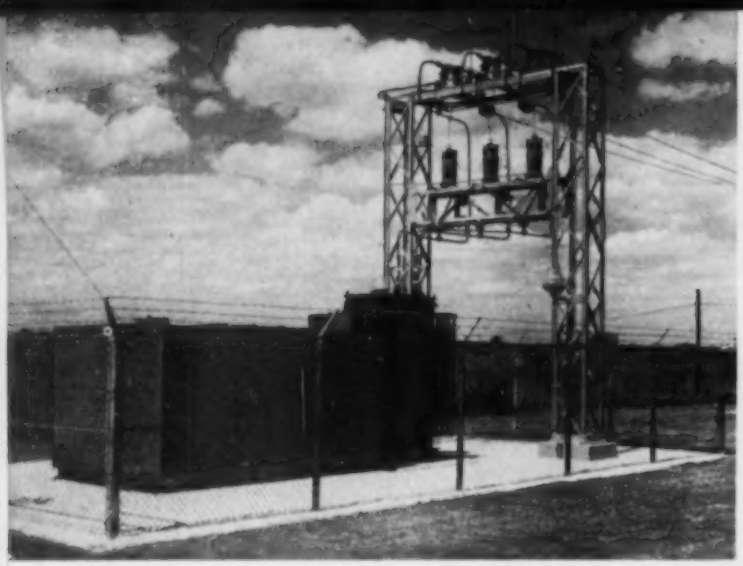
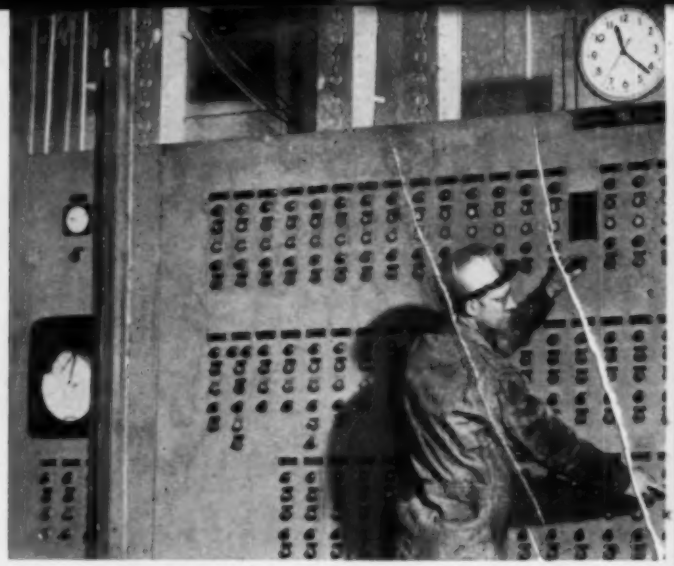
Take advantage of these G-E Engineering Services early in your planning stages. Your G-E Apparatus Sales Representative will put them to work for you. Contact him at your nearest Apparatus Sales Office. General Electric Co., Schenectady 5, N. Y. 663-43

CUT YOUR OPERATING COSTS ►

GENERAL ELECTRIC



RELIABLE source of power is available with G-E master unit substations. Units are factory-assembled to save installation time.



PUSH-BUTTON OPERATION of plant is available with G-E master control boards. They are designed to control vari-

G-E electrical systems help . . .

LOWER YOUR

To meet today's market conditions the Coal Industry is seeking new ways to cut operating costs in preparation plants. One sure way to help lower operating costs is to install a G-E electrical system. **Here's why:**

AUTOMATIC G-E CONTROLS help eliminate unnecessary manual operations. General Electric's modern electrical systems incorporate these controls wherever possible.

LOW MAINTENANCE is an outstanding feature of General Electric electrical systems. Newly-devel-

FACTORY-ASSEMBLED G-E unit substations help assure efficient transmission of power to load areas. Addition of G-E capacitors to substations increases capacity and cuts power costs.

Engineered Electrical Systems for Coal Preparation Plants

COMPACT G-E Cabinetrol* equipment provides centralized control for motors. Custom-engineered, they are easy to expand.

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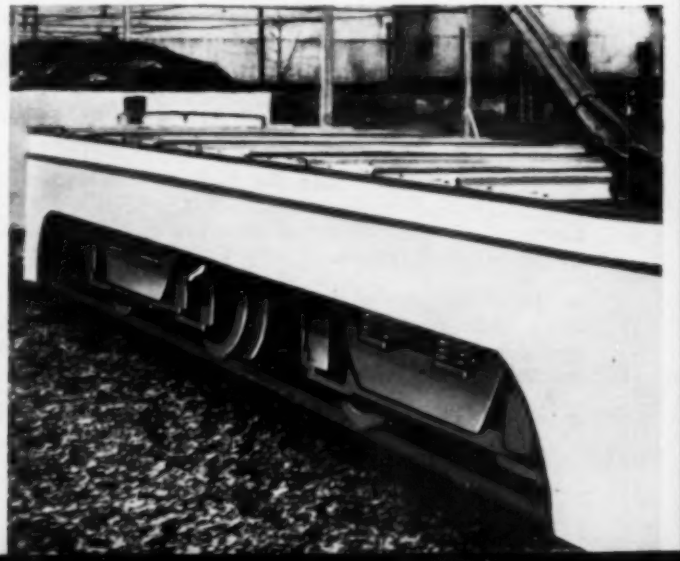
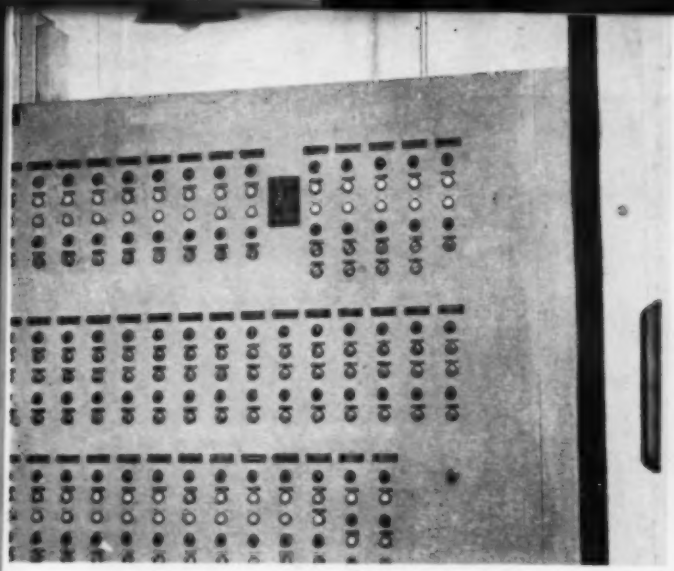
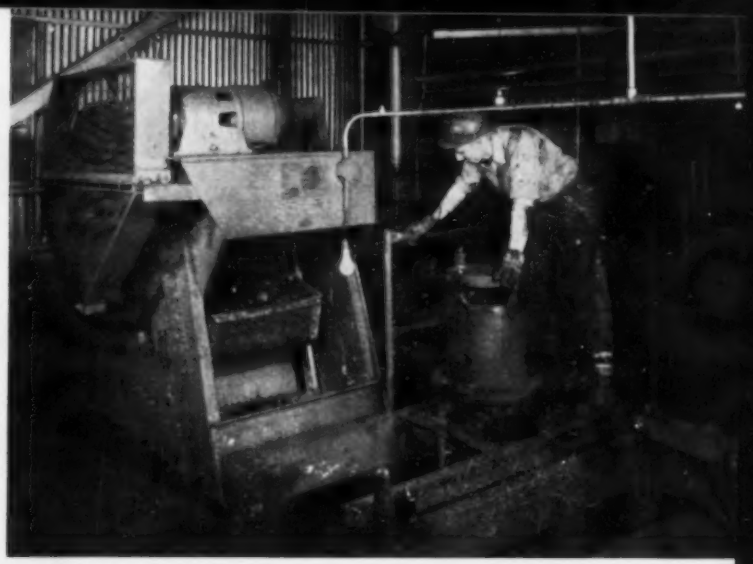
LOW MAINTENANCE is outstanding characteristic of G-E mine-haulage locomotives. They will help haul more tons





ous cleaning operations from one central location, and give visual indication all units are running.



RUGGED G-E Tri-Clad* gear-motors are packaged, single units. They use little more room than a standard motor, freeing more floor space.

*Reg. trade-mark of General Electric Co

OPERATING COSTS

oped electric equipment designed for less maintenance is utilized throughout.

EASY TO EXPAND with market conditions is a General Electric electrical system. Its flexible design makes the installation of additional equipment easy and practical.

To learn more about General Electric's modern electrical systems for coal preparation plants contact your nearest G-E Apparatus Sales Representative. General Electric Company, Schenectady 5, New York. 663-43

COMPLETE LINE of G-E Tri-Clad motors for coal preparation plants are designed for a minimum of maintenance. Totally-enclosed fan cooled construction helps protect motors against dust.

GENERAL ELECTRIC

per day to prep plant. Easy-to-operate controls are grouped for the convenience of the operator.

EXPERIENCED G-E ENGINEERS are ready to help design, co-ordinate and install an up-to-date electrical system for your plant.

Tired of sloppy welds?

Switch to this Tigerweld BF-12 Rail Bond

THIS bond gives you a better weld than any other bond of the same type. That raised shoulder you see on the terminal forms a deep V-trough between the bond and rail. You can lay a lot more metal in that notch than you can put on ordinary bonds. As a result, you're sure of getting a weld that will hold.

The bond itself is just as strong as the weld. The terminal is made of a good husky piece of steel, and it's *butt-welded* to the strand for permanence.

This is a clamp-type bond, and that means fast, easy installation. Just rap the terminals on with a hammer. They stay in place while you make your welds.

Write for complete details, or get in touch with our nearest distributor.

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USS Tigerweld Rail Bonds

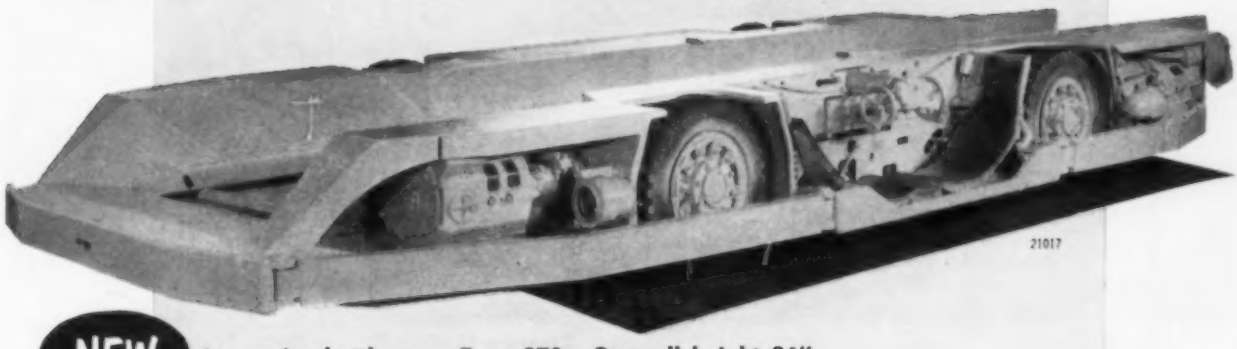
USS

UNITED STATES STEEL

High Tonnage In Low Coal?

Yes... With These Goodman Machines On The Job

NEW **Low vein loader Type 965**
Over-all height 26½"



NEW **Low vein shuttle car Type 870 Over-all height 26"**

The 965 is a rugged, fast working loader equally effective in handling coal, rock or slate at a rated capacity exceeding 8 tons per minute. It is easily maneuvered on its treads for close quarter work. Swing and elevation of discharge end permit loading in any desired position. Two 20 hp motors power the gathering arms and conveyor chain; two 15 hp motors serve for tramming and for powering the hydraulic pumps.

The 870 shuttle car combines a structural strength generally found only in big cars for high coal with speed and capacity that make it an ideal teammate for the 965 loader. Standard Goodman features include: 4-wheel drive, 4-wheel power steering, 4-wheel brakes, hydraulic controlled cable reel. U. S. Bureau of Mines approved.

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GOODMAN for the most advanced designs in a complete line of machinery for continuous and conventional mining

NEW SUPER RAYNILE CONVEYOR BELT 400% STRONGER

Provides the economical answer to transporting coal and other bulk materials over long distances and up steep slopes.

This remarkable new Hewitt-Robins conveyor belt reinforced with the revolutionary synthetic fabric, Super Raynile, makes possible an entirely new concept in single-section conveyor application. It solves difficult materials handling problems where topography and other conditions require the use of a long single-length conveyor.

Already in service, Super Raynile has the highest operating tension of any conventional carcass belt. Because of its tremendous tensile strength, 400% greater than conventional cotton reinforced belts, a single conveyor section *5¾ miles long* can be built over level terrain to carry material at 400 TPH using only a 6-ply Super Raynile belt 30 inches wide. This same belt can also lift material from ground level to a height of 830 feet.

The new Hewitt-Robins Super Raynile conveyor belt is highly flexible and pliable despite its great strength. Its cost is less than steel-reinforced belts and Super Raynile can easily be spliced in the field more quickly, more economically and without the specialized equipment required to splice steel-reinforced belts.

Super Raynile belt is available in a wide range of specifications . . . widths up to 72"—thickness up to 15 plies.

Learn more about this new long-length, long-life conveyor belt. Contact your local Hewitt-Robins Industrial Supply Distributor (see Classified Phone Book), or write direct to "Super Raynile Belt", Hewitt-Robins Incorporated, Stamford, Connecticut.

Hewitt-Robins

Conveyor Belting—Industrial Hose—Conveyor Machinery—Vibrating Screens—Vibrating Conveyors—Design, Manufacture, Engineering and Erection of Complete Bulk Materials Handling Systems.

HEWITT-ROBINS INCORPORATED • STAMFORD, CONNECTICUT

New Increased Power
INTERNATIONAL TD-18A
Now with 103 Drawbar HP

LOOK AT THAT LOAD as operator applies 103-drawbar hp of new TD-18A. Steering is effortless with new hydraulic finger-tip controls and positive, self-energizing brakes.

NEW Power . . . New gearing . . . New ruggedness —for greater production

NEW Track Frames . . . 300 per cent stronger

NEW Finger-Tip Power Steering . . . advanced hydraulic design

NEW Operator Compartment . . . comfortable driver's seat —easy-to-reach controls

NEW Track Roller Oil Seals . . . 500-hour period between lubrications

NEW Positive Self-Energizing Brakes, 13% more effective brake area

NEW Appearance . . . sleek grille, heavy fenders, 75-gallon fuel tank. Better visibility . . . control-tower view front and rear

Here's the crawler tractor with everything contractors need to meet increased competition—increased workpower, increased ease of operation, increased durability:

The improved INTERNATIONAL TD-18A, now with 103-drawbar horsepower at 24,300 lbs. maximum drawbar pull in first gear at rated rpm.

Double check all these great new TD-18A features—right here on this page—on your job where you can take over the controls and appraise their value in extra work done for lower cost. Your INTERNATIONAL Industrial Power Distributor will arrange your own personal shake-down test of the TD-18A any time you say.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

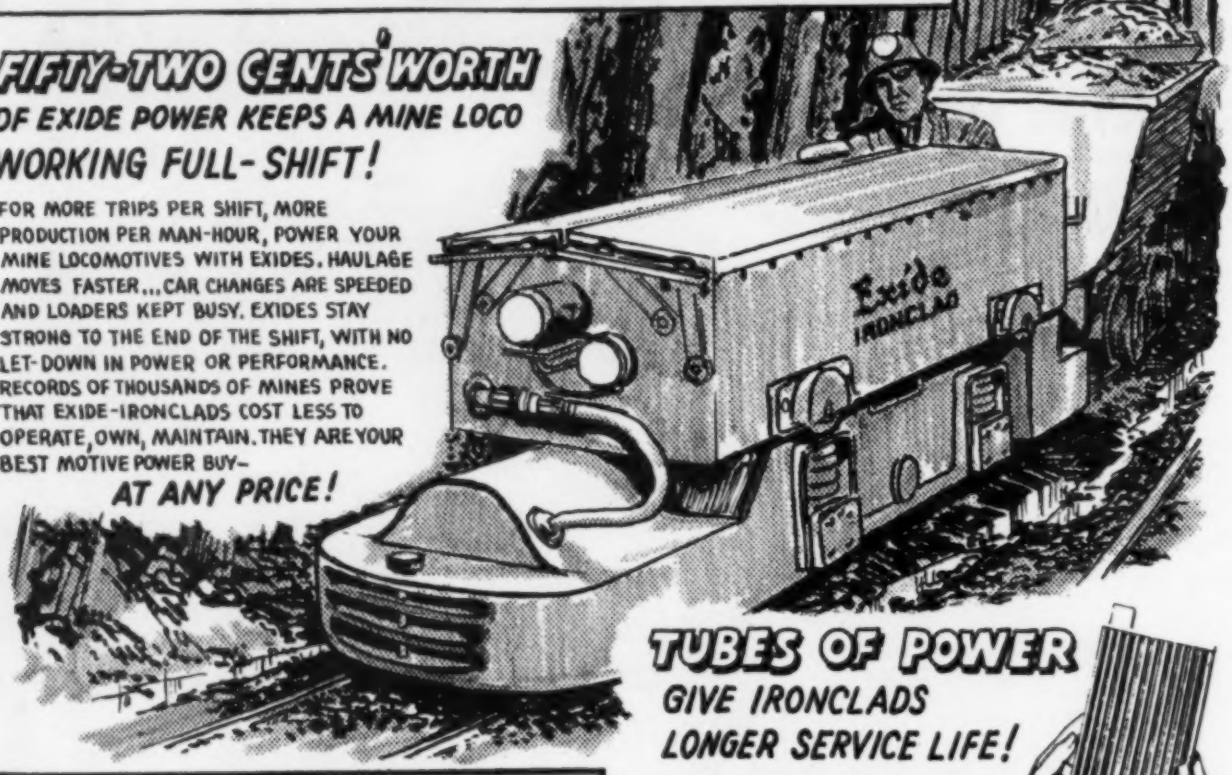
INTERNATIONAL HARVESTER

INTERNATIONAL® INDUSTRIAL POWER

MAKES EVERY LOAD A PAYLOAD

FACTS ABOUT Exide®

IRONCLAD® MINING BATTERIES



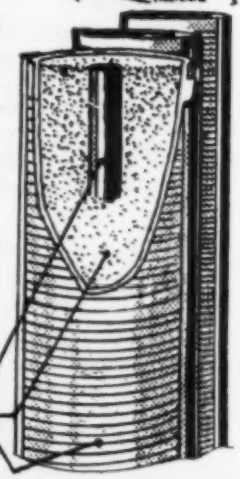
FIFTY-TWO CENTS' WORTH OF EXIDE POWER KEEPS A MINE LOCO WORKING FULL-SHIFT!

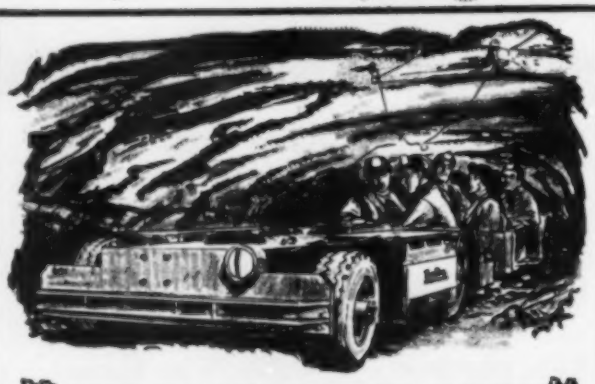
FOR MORE TRIPS PER SHIFT, MORE PRODUCTION PER MAN-HOUR, POWER YOUR MINE LOCOMOTIVES WITH EXIDES. HAULAGE MOVES FASTER... CAR CHANGES ARE SPEEDED AND LOADERS KEPT BUSY. EXIDES STAY STRONG TO THE END OF THE SHIFT, WITH NO LET-DOWN IN POWER OR PERFORMANCE. RECORDS OF THOUSANDS OF MINES PROVE THAT EXIDE-IRONCLADS COST LESS TO OPERATE, OWN, MAINTAIN. THEY ARE YOUR BEST MOTIVE POWER BUY—

AT ANY PRICE!

TUBES OF POWER GIVE IRONCLADS LONGER SERVICE LIFE!

FINELY SLOTTED TUBES INSIDE AN IRONCLAD KEEP THE ACTIVE MATERIAL IN FIRM CONTACT WITH THE CONDUCTING GRIDS OF THE POSITIVE PLATE. THUS, THE GRID IS PROTECTED... THE ACTIVE MATERIAL IS KEPT IN CONTACT WITH THE GRID LONGER... *THE BATTERY'S WORK LIFE IS LENGTHENED.* THE SLOTTED TUBES ALSO EXPOSE MORE ACTIVE MATERIAL TO THE ELECTROLYTE... *FOR GREATER POWER!* RESULT: THE IRONCLAD'S ABILITY TO DO A DEPENDABLE JOB FOR A LONGER PERIOD OF TIME.





"UNDERGROUND TAXI" CUTS COSTS, BOOSTS PRODUCTION WITH EXIDE-IRONCLAD POWER!

THIS EXIDE-POWERED TRACTOR-TRAILER SPEEDS WORK CREWS, SUPPLIES AND EQUIPMENT TO PRODUCTION AREAS IN HALF THE TIME OF OTHER METHODS—WITH SAFETY, AND AT LOWEST COST. TO CUT PORTAL-TO-PORTAL TRAVEL TIME OR BOOST PRODUCTION, LET EXIDES HELP YOU. YOU'LL DO IT FASTER, BETTER, CHEAPER!

LET EXIDE HELP SOLVE YOUR MINING BATTERY PROBLEMS. ❶ CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ❷ WRITE FOR FORM 1982, A MANUAL ON MAINTAINING MOTIVE POWER BATTERIES.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

For vital protection...
when the heat is on

AMOCO HDX Motor Oil

Summer dust and high temperatures bring special lubricating problems with them—problems that are efficiently solved in both gasoline and diesel operated engines with Amoco HDX Motor Oil.

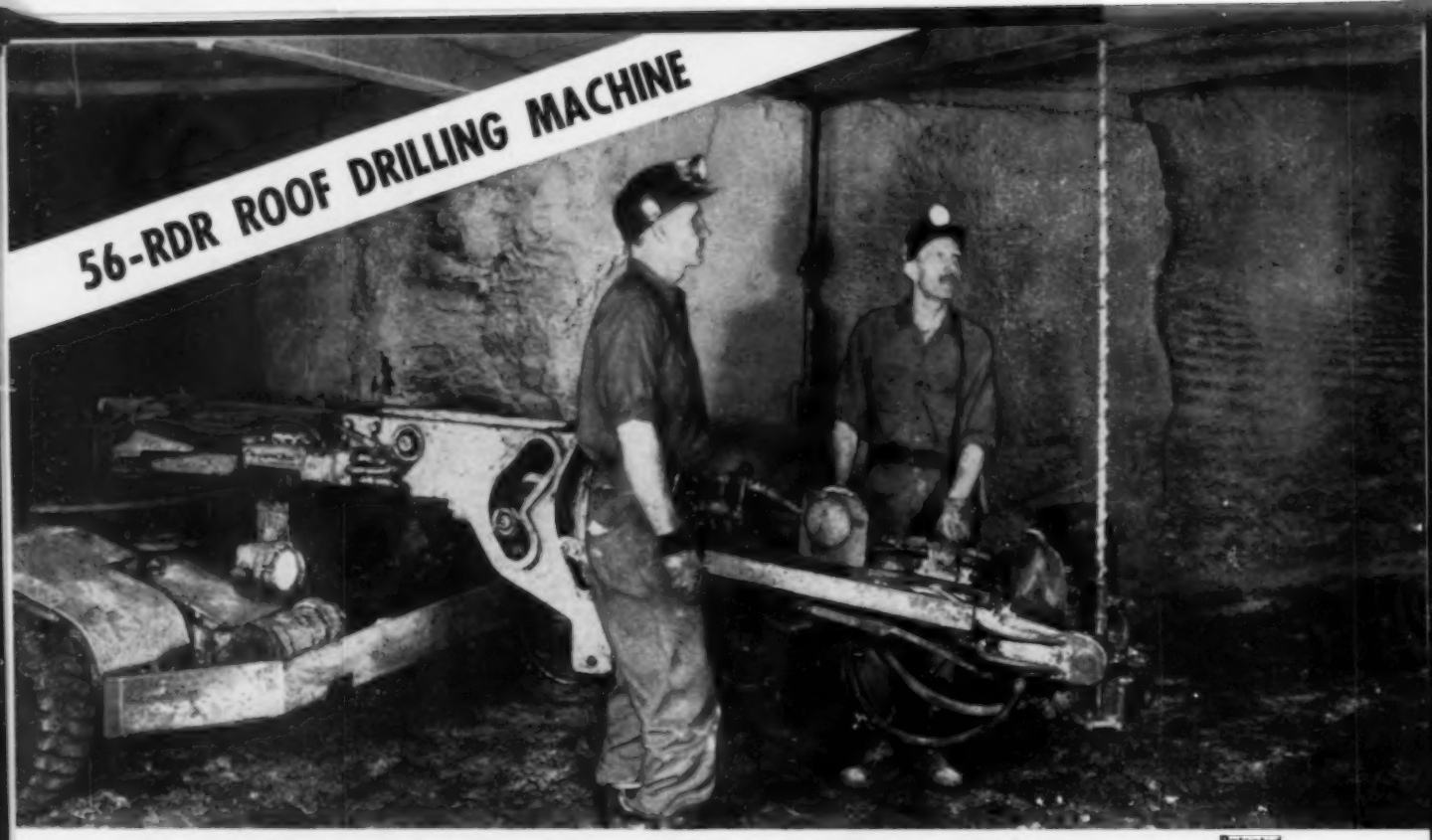
This high-detergent, non-gumming, non-corrosive oil works right into hard-working engine parts . . . keeps them clean and keeps them lubricated . . . and stays on the job, no matter how the mercury zooms.

And Amoco HDX Motor Oil helps protect operating profits all summer long. Call or write your nearest Amoco man for more information.

AMOCO LUBRICANTS

. . . SURE • SAFE FOR MINE MACHINERY

AMERICAN OIL COMPANY, NEW YORK



Patented

fast full-time roof bolting...

It's a big, rugged, high-capacity machine for round-the-shift work. It trams fast. It can bolt a wide room from one position. The Jeffrey 56-RDR Roof Drilling machine has extra features that pay off in bigger production, lower maintenance.

This unit is especially well adapted to mines demanding a sturdy, stable machine . . . one that is expected to work a normal shift's roof drilling and bolting, plus extra places on some shifts.

Performance, like the following example, field-proves the 56-RDR's excellence: in the Pittsburgh seam, 84" to 96" high, a crew of two men with the 56-RDR drilled and bolted 23 working places or 138 holes 5' deep. Besides, they drilled coal holes for shooting in 19 of these places, 4 holes per place or 76 holes 8' deep. These were drilled with a hand-held hydraulic drill operated through a power takeoff from the 56-RDR.

Bolts ranged from 4' to 7', average being about 5'. Holes were drilled through 6" to 12" top coal . . . 1' drawslate . . . "wild coal" varying in thickness from 2" or 3" to 1' . . . "white rock" strata of clod 1' to 3' thick — to find anchorage in a black slate shale above.

Check these features — only three of many on the 56-RDR:

- Drill boom controls are centralized and within easy reach of the operator.
- Size and stability make unit ideal carrier for generous quantities of roof bolt materials and drill supplies.
- Cable reel of superior design pays off in extremely low cable costs over a period of years.

For additional information, write to Mining Sales Division, The Jeffrey Manufacturing Co., Columbus 16, Ohio. District Offices in Beckley, Birmingham, Chicago, Denver, Pittsburgh, Harlan, Salt Lake City.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Fast and flexible operation, top picture, is aided by drill arm swing of 10' 9½" right or left of center. Wide room can be bolted with minimum truck maneuvering.

Besides supplies, 56-RDR pictured at right carries Jeffrey A9A Hand-Held Hydraulic Drill which operates through a power takeoff for face drilling of powder holes.

The Wear and Tear of Relocation Doesn't Harm

SIMPLEX-ANHYDREX BOREHOLE CABLE

Simplex-ANHYDREX Borehole Cable, carefully and properly pulled out of old boreholes, can be hung over again without risk of damaging its physical properties and its electrical performance.

ANHYDREX Cables can be pulled out and relocated because they have no heavy lead sheath.

ANHYDREX Cables were developed to take the place of lead-covered cables.

Both the armored and the rubber-jacketed types of ANHYDREX are lighter and much easier to bend than any lead-covered cable.

ANHYDREX insulation gives long, trouble-free service.

Built-in heat resistance of these cables defies deep mine temperatures.

ANHYDREX is the most nearly perfect water-resistant rubber insulation ever known.

Special Simplex Borehole Cables can be made for use in mines where corrosive acid is extremely severe.

Write the address below for more details.

Simplex– ANHYDREX Borehole Cable

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Sure of the Right Hoist?

BROWNIE LINE helps you select the right hoist to meet your needs

There is a very easy, quick method for assuring yourself of obtaining the exact hoist to meet any hoisting requirement. Simply investigate the Brownie Line—the coal industry's most complete.

In the Brownie Line you will find Rigging Hoists, Room Hoists, Haulage Hoists, Car Spotting Hoists, Layer-Loading Hoists—hoists for every haulage use. Among our various types and models available are hoists with rated capacities from 2,000 to 24,000 lbs. rope pull and with speeds from 25 to 300 feet per minute. Also, remote push-button control is available to save time where it is practicable. Ask us for complete information on the Brownie Line. Also investigate our Oil Spray Outfits, Gathering Pumps and Pump Accessories, Blowers, Brownie Rerailers and Derailers.

Brown-Fayro Division, Sanford-Day Iron Works, Inc. Write P. O. Box 1511 . . . Call 3-4191, Knoxville, Tenn.

Sanford-Day IRON WORKS

KNOXVILLE • TENNESSEE

AND **BROWN-FAYRO** DIVISION

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS
CAR RETARDERS - SPOTTERS
PUMPS - OIL SPRAY SYSTEMS

Bucyrus-Erie 950-B stripper removes overburden from Traux-Traer Coal Company seam in Fulton County, Illinois. Operation is one of the largest open pit mines in Fulton County, Illinois' second biggest coal producing county. CALUMET Viscous provides lubricant shield for roller swing gear.

Stripper rides on CALUMET *Viscous Lubricant*

CALUMET Viscous Lubricant has been assigned the job of protecting circle rail rollers and swing gears on a 950-B Bucyrus-Erie stripper at Traux-Traer Coal Company's mine in Fulton County, Illinois. It's been doing this job—and doing it well—for many years. It has had to, for delivering top performance is expected of both lubricants and equipment at this mine. The production goal is a stiff 1,000 tons of coal an hour.

The stripper operates continuously in all kinds of weather—hot, cold, wet, dry, dusty. Selection of CALUMET Viscous Lubricant for this job was a logical decision. CALUMET Viscous is designed to perform under just such conditions. Its adhesive qualities make it stick to gear surfaces and form a near perfect gear shield. It doesn't sling off during warm weather or chip off in cold weather. It can be applied easily and evenly when sprayed or swabbed, does not require preheating.

CALUMET Viscous is one of a large number of lubricating greases in the Standard line. In the Midwest, a lubrication specialist from your nearby Standard Oil office will be happy to tell you about them. Call him today, or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Bob Wright, Standard's lubrication specialist, mounts steps to inspect roller swing gear lubricated with CALUMET Viscous. On-the-spot technical help such as this is one of the services Bob performs for his customers. Bob's training includes a B.S. in engineering from Michigan College of Mining, and Bob has completed the Standard Sales Engineering School. Customers find such training pays off for them.

STANDARD

STANDARD OIL COMPANY (Indiana)

"Our *Tiger Brand*

NOTICE THE CABLE TRAY fastened to the shovel. This was developed by Universal Atlas for easier cable handling.

TWO WORKMAN WATCH from blast shelter as charge is set off in distance. Low horses cushion cable from shock of falling rock.

HERE A CABLE is raised on horses to clear the railroad track. It feeds the shovel visible in background.

Amerclad lasted 12 years"

Says Chief Electrician, Hudson Plant
Universal Atlas Cement Company

Year after year, at this quarry, the Amerclad is exposed to knife-sharp fragments of flying rock. During the summer, the rock often gets so hot that you can't even touch it. Other times, the cable lies out in the rain and snow—often at sub-zero temperatures.

At the Hudson, N. Y. quarry of Universal Atlas, Chief Electrician Frank Rodmond said, "This Amerclad runs the constant danger of being hit with flying rock fragments through secondary blasting. Yet the down-time cost of this operation is so high that we just can't stand cables that keep failing. We kept that last batch of Amerclad 12 years before we replaced it, yet it was still serviceable when we switched over to new Amerclad."

If you want service like this, specify Amerclad the next time you need cable that can really take it. Amerclad is available in a great many sizes and constructions, with or without shielding. There is a type to power anything from a river dredge or mine locomotive down to a rough and tumble electric hand drill. *Send the coupon,* and get more information.

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

THIS IS A TYPICAL DRILL. It uses a 4-conductor No. 8 Amerclad cable.

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

paper & varnished cambric cable
asbestos wire and cable
aerial, underground & submarine cable
mold cured portable cord
machine tool & building wire
special purpose wire & cable
shovel & dredge cable

—SEND THE COUPON—

American Steel & Wire Division
Room FE-85, Rockefeller Building
Cleveland 13, Ohio

☐ Please give me more information about Amerclad.
☐ I'd like to talk to your representative.

Name .....
Firm .....
Address .....
City ..... State.....

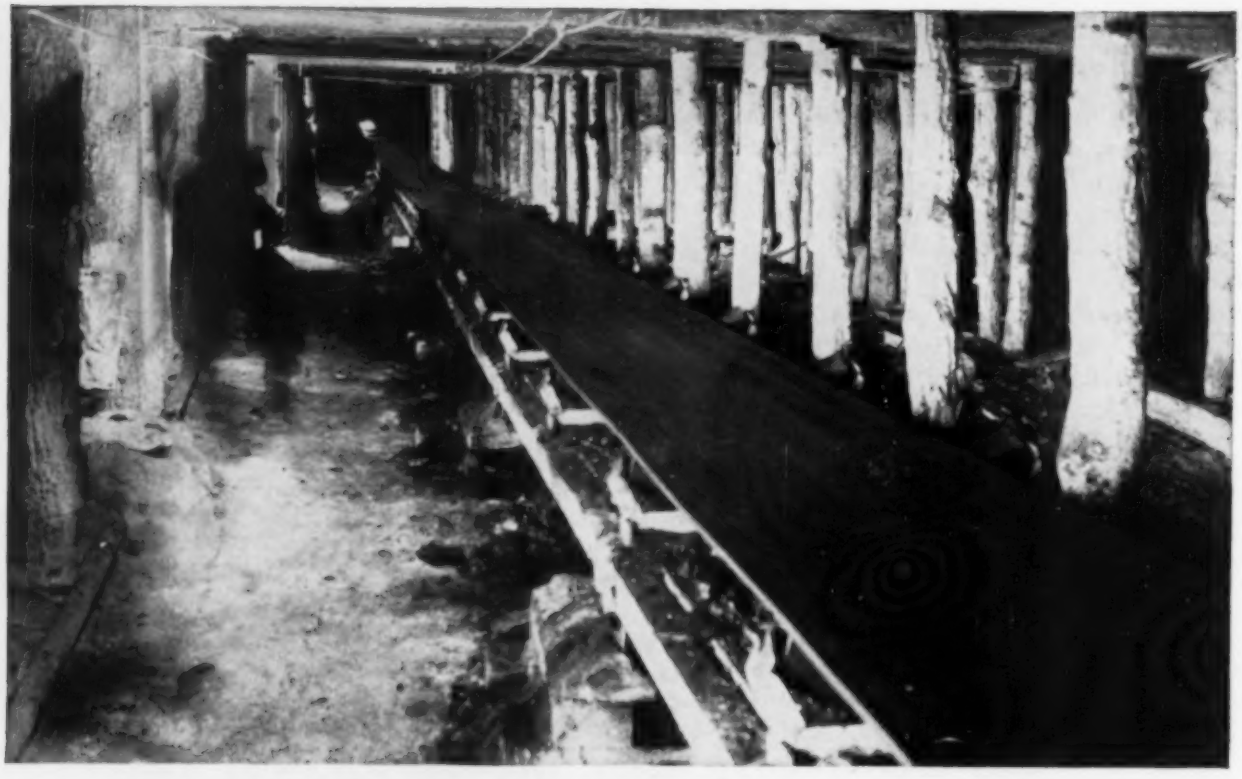
U·S·S Tiger Brand ELECTRICAL WIRE & CABLE

USS

UNITED STATES STEEL

Warner Collieries' Betty Mine reports: **"Belt reinforced with 'Cordura' rayon trains perfectly . . . loaded or empty"**

REG. U. S. PAT. OFF.



NOW Du Pont SUPER CORDURA makes belts even stronger

REG. U. S. PAT. OFF.

The picture above shows the mother belt in the Betty Mine, Warner Collieries, Mammoth, W. Va., moving toward the mine entrance unloaded. Below is a view of the same belt heavily loaded. According to Willard Smith, veteran operator, the belt trains perfectly, whether loaded or empty. The belt was manufactured by Goodyear Tire & Rubber Co. of a 4-ply carcass of Du Pont "Cordura"* high tenacity rayon.

Now there's a new, stronger reinforcement for conveyor belting—Du Pont "Super Cordura"* high tenacity rayon. "Super Cordura" stretches even less in use and permits belts that are stronger and more flexible. Downtime for take-up and resplicing is reduced to a minimum.

A product of Du Pont research, "Super Cordura" is 20% stronger than ordinary high tenacity rayon. You're assured of extra stretch resistance . . . extra flexibility . . . top performance under the most rugged conditions of use. Write us for the names of suppliers, E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Dept., Room 11506 Nemours Bldg., Wilmington 98, Delaware.

STRONGER AND THINNER, this rayon-reinforced belt is 1,750 feet between centers. Driven by a 40-horsepower motor, it travels at a speed of 390 feet per minute.

*Du Pont's registered trade-mark for its high tenacity rayon yarns.

DU PONT *Super Cordura*
High Tenacity Rayon

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

GM DIESEL
CASE HISTORY No. 1A3-16

OWNER: Crowe Coal Company, Kansas City, Mo.

INSTALLATION: Six GM Diesel-powered Dart trucks . . . three 20-ton rear-dumps and three 40-ton bottom-dumps. GM Diesel-powered Bucyrus-Erie #38-B shovel with 2¼-yard bucket. The company also operates three 20-ton bottom-dumps powered with 4-cycle Diesels.

PERFORMANCE: GM Diesel-powered trucks have faster pickup, respond to throttle controls better, use less lube oil. Engines take less time—cost less to overhaul. Shovel strips 1000-1200 tons of coal in 7¼ hours—burns 4 gallons of fuel per hour.

Quicker Pickup-Faster Hauling

MISSOURI's Crowe Coal Company operates nine trucks—six powered by General Motors 2-cycle Diesels and three with 4-cycle Diesels. They report the GM Diesel-powered trucks "respond quicker, use less lube oil, are easy to overhaul."

A General Motors Diesel does "respond quicker." It gets more work done than most engines, partially because of its 2-cycle "power on every piston downstroke" design. It costs less to buy. It costs less to maintain because GM Diesel replacement parts cost less (valves up to 62% less and cylinder liners up to 40% less) than parts for comparable Diesels.

Today you can get GM Diesel power in more than 750 different models of equipment built by over 150 manufacturers. Call in your local GM Diesel distributor or write direct for more information.

It Pays to Standardize on

GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS • DETROIT 28, MICHIGAN

Single Engines . . . 30 to 300 H. P. Multiple Units . . . Up to 893 H. P.

"...per ton of coal, Stainless Steel costs less than any other material"

SAYS SWATARA COAL COMPANY, TREMONT, PA.

Notice the perizer treads on these Stainless Steel shaker screens. They give better tumbling action.

Close-up of above picture. No screen has ever cracked.

Stainless Steel screens last about 18 months in this vibrator, equivalent to 170,000 tons of coal.

The Swatara Coal Company produces about 2500 tons of anthracite a week. The fine media coal separator consists of a 5 x 16-foot vibrating shaker, dewatering troughs and media cleaning machines. Each device is a showplace for abrasion-resistant Stainless Steel. Sizes of coal cleaned range from egg to #1 buck in the media process.

The impact segment of the shaker (where the coal is dropped) lasts a full 6 months. The other 3 segments have been in service 18 months, and are still in good condition. Each segment is made from 14-gauge Stainless Steel.

Average screen life in the dewatering trough is about 18 months; but some screens have been in service since the plant was opened in 1947 and they're *still* going strong!

In the cleaning machines, the Stainless Steel flumes have shown an average service life of 15 months—processing about 250,000 tons of coal and waste before replacement.

Stainless Steel has completely solved the rust and blinding problems, according to management. But more important, " . . . per ton of coal, Stainless Steel costs less than *any* other material."

Do these results look good to you? Then specify service-tested USS Stainless Steel.

SEE "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—
Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

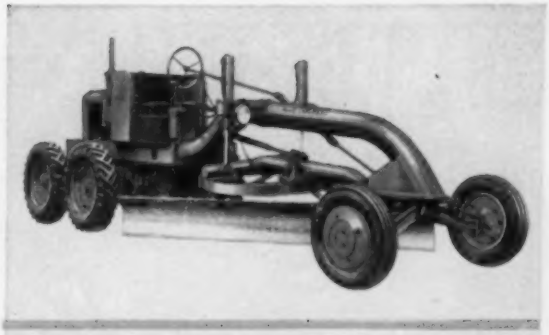
5-1028

UNITED STATES STEEL

Model D *Standard* (GASOLINE ENGINE)

STANDARD EQUIPMENT: Six-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. moldboard, hydraulic controls for moldboard lift, four 7.50-20 rear and two 6.50-16 front tires with tubes.

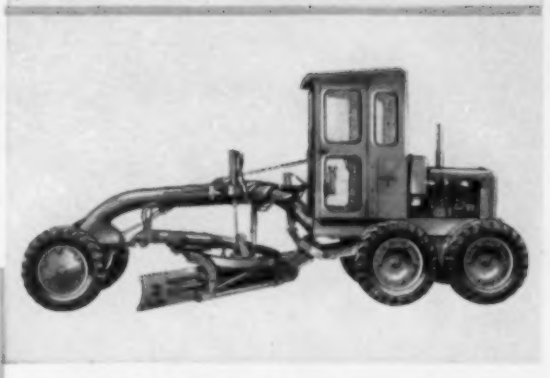
Total weight	8,800 lb	Blade pressure	4,900 lb
Wt. on front wheels	2,700 lb	Four speeds forward to	25.6 mph
Wt. on rear wheels	6,100 lb	Reverse to	3.3 mph



Model D *Special* (GASOLINE ENGINE)

FULLY EQUIPPED AS FOLLOWS: Six-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. hydraulically shiftable moldboard, 6-valve control group, four 8.25-20 rear and two 8.25-20 front tires with tubes, front wheel lean, power circle turn, hydraulic scarifier, all-steel cab.

Total weight	10,900 lb	Blade pressure	6,450 lb
Wt. on front wheels	3,750 lb	Scarifier pressure	4,900 lb
Wt. on rear wheels	7,150 lb	Four speeds forward to	25.6 mph
		Reverse to	3.3 mph



Match your grading needs with new economy and efficiency

From the Allis-Chalmers Model D motor grader line

Both gasoline and diesel Model D's are available with any combination of accessories.

NOW AVAILABLE WITH YOUR CHOICE OF TWO OUTSTANDING ALLIS-CHALMERS ENGINES

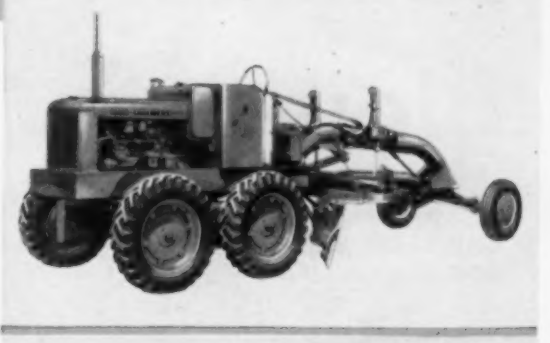
50 - hp POWER-CRATER gasoline engine

50 - hp diesel engine with follow-through combustion

Model D Diesel *Standard*

STANDARD EQUIPMENT: Twelve-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. moldboard, hydraulic moldboard lift controls, four 7.50-20 rear and two 6.50-16 front tires with tubes.

Total weight	9,350 lb	Blade pressure	4,900 lb
Wt. on front wheels	2,760 lb	Four speeds forward to	25.2 mph
Wt. on rear wheels	6,590 lb	Reverse to	3.2 mph



Model D Diesel *Special*

FULLY EQUIPPED AS FOLLOWS: Twelve-volt electrical system, two headlights, one rear and stop light, muffler, 10-ft by ⅝-in. hydraulic shiftable moldboard, 6-valve control group, four 8.25-20 rear and two 8.25-20 front tires with tubes, front wheel lean, power circle turn, hydraulic scarifier, all-steel cab.

Total weight	11,450 lb	Blade pressure	6,450 lb
Wt. on front wheels	3,750 lb	Scarifier pressure	4,900 lb
Wt. on rear wheels	7,700 lb	Four speeds forward to	25.2 mph
		Reverse to	3.2 mph

You can still buy a model D for one-third the cost of a large motor grader, and it's the most popular, most versatile small grader on the market. In addition to the units illustrated, the Model D is available with other combinations of accessories . . . or with any of these useful attachments: rear-mounted ⅝-cu-yd loader; shoulder maintainer; one-pass windrow eliminator; V or blade-type snowplows. Ask your nearby Allis-Chalmers dealer for a demonstration . . . and prove the Model D's value.

POWER-CRATER is an Allis-Chalmers trademark.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

a new 12A-83 JEFFREY AERODYNE FAN

PATENTED

blows air . . . not money!

Only a fan engineer can recommend the right type and size ventilation unit for a particular mine operation. The wrong fan can be inefficient, wasteful and costly . . . can literally blow money right out the "stack". The right fan will perform as predicted . . . may reduce power expenditure in just a few years equal to the fan's initial cost.

Continuing confidence in Jeffrey fan leadership is proven again and again as additional mines modernize with new ventilation units. Only a quality product backed by wide engineering and manufacturing experience inspires such confidence.

Since 1907, Jeffrey has sold more than 10,000 fans and blowers of all types for mine use. Hundreds of these, beginning in 1936, have been powerful, efficient AERODYNES like the one shown here.

Jeffrey consultation on ventilation problems is always available at no obligation. Before you buy *any* fan . . . new or used . . . see Jeffrey.

FOR HEAVY DUTY . . . the popular 8H Series and the deluxe 12A Series.

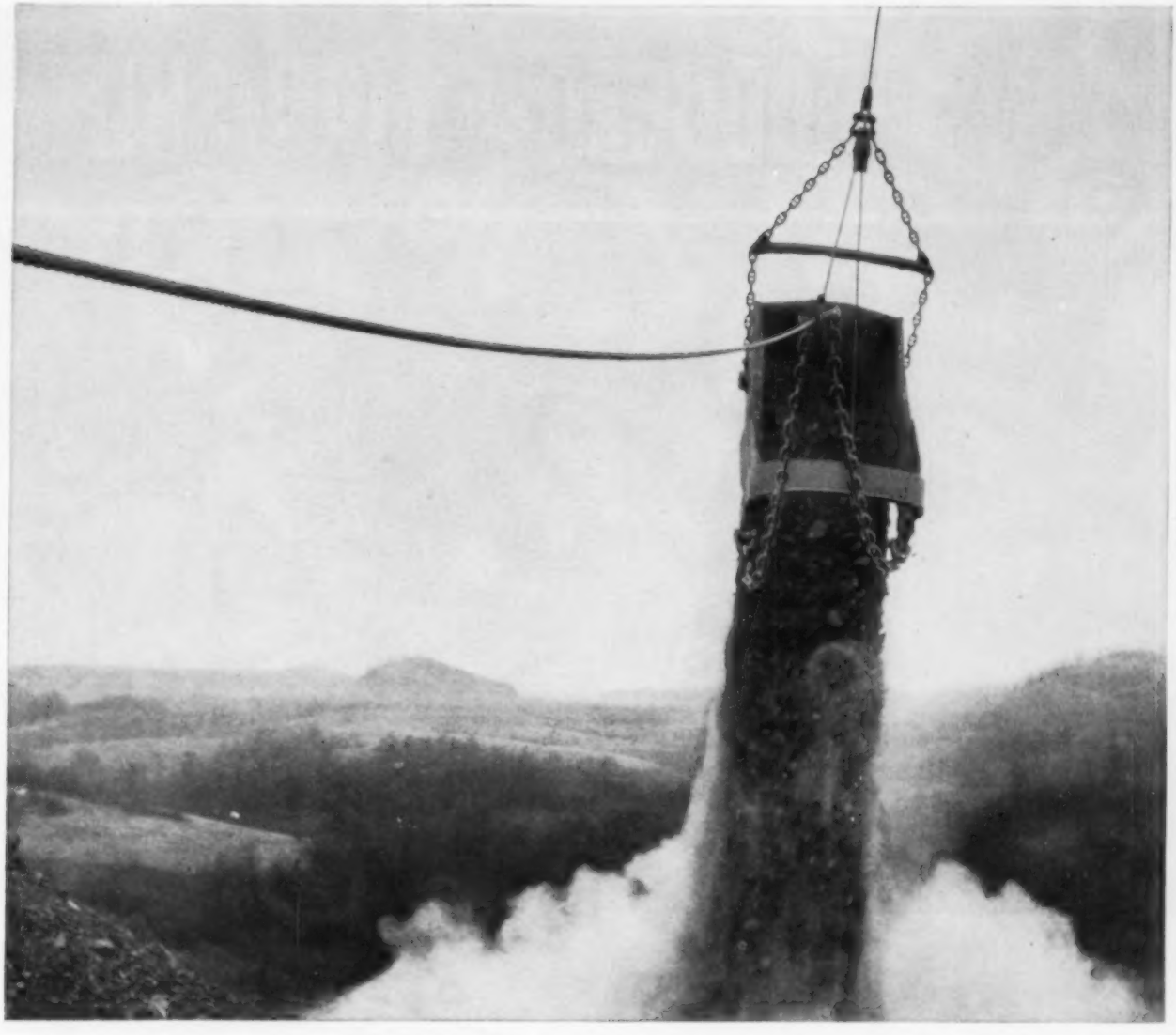
FOR MEDIUM DUTY . . . the economical 6F Series and the low cost AERODYNE Jr.

FOR LIGHT DUTY . . . AERODYNE Midget Blowers, Type 61 Blowers, Universal Blowers.

Write to Mining Sales Division, The Jeffrey Manufacturing Co., Columbus 16, Ohio. District Offices in Beckley, Birmingham, Chicago, Denver, Pittsburgh, Harlan, Salt Lake City.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING



Here's where J&L Wire Rope cuts your costs

On the big rigs like this, wire rope is an important cost item. That's why so many big mining men look to J&L for Wire Rope that fits their equipment requirements . . . for the right combination of strength, flexibility and toughness to stay on the job.

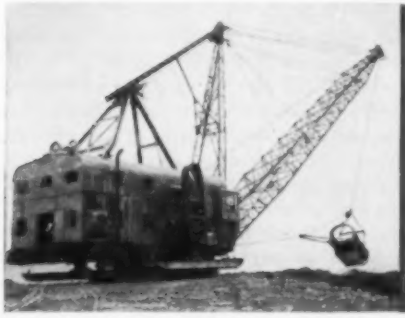
They've found the quality of J&L Wire Rope is reflected on the profit sheet in terms of minimum downtime for re-rigging, lower rope costs and more tons mined per wire rope dollar.

J&L Wire Rope quality is the combination of more than 100 years of steelmaking experience, topflight wire rope engineering and the most modern production equipment. The result—every wire, every strand, every J&L Wire Rope is "precisionbilt" for maximum service.

No matter what equipment you're operating there's a J&L Wire Rope designed to give you cost-cutting service life. Write today for complete information on J&L Wire Ropes.

Jones & Laughlin

STEEL CORPORATION — *Pittsburgh*



J&L STEEL

Jones & Laughlin Steel Corporation
411 Gateway Center, Pittsburgh 30, Pa.

Please send me complete information on J&L Wire Ropes.
Please have your representative call.

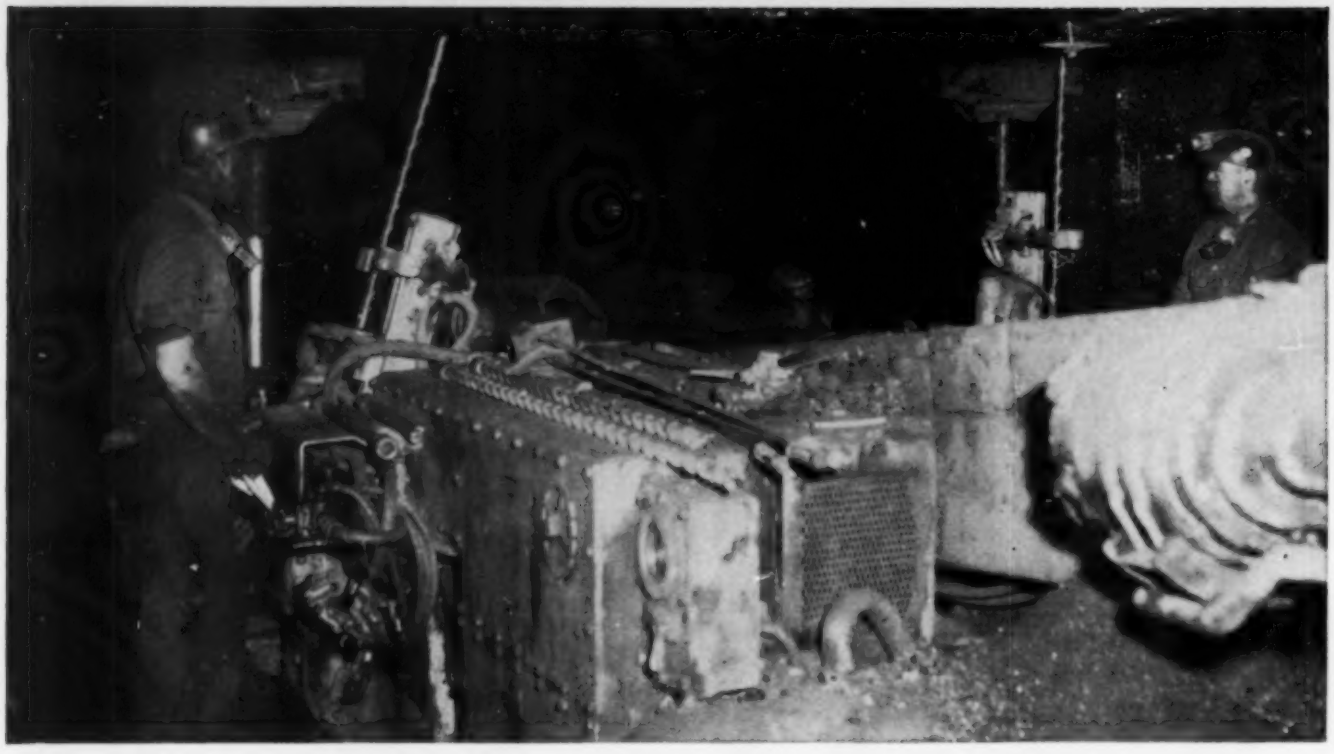
Name_____

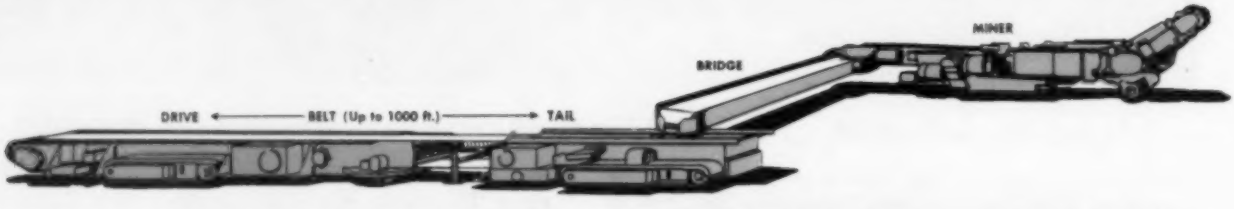
Title_____

Company_____

Address_____

TONS PRODUCED PER MAN-SHIFT . .





The JOY "1-CM-EX-BELT" COMBINATION

points the way to increase your profit margin

Here's a mining team that can really slash your production costs, as the operating figures on the facing page adequately prove. The Joy 1-CM Continuous Miner, teamed with the Joy Extensible Belt Conveyor for continuous haulage, provides a combination that is the absolute last word in low-cost, high-production mechanized mining in seams of 52" and higher.

For lower coal, the popular 3-JCM Continuous Miner—only 34" high over-all—takes over the extracting job. And for full-face mining in seams of approximately 6 to 8 ft., the powerful Joy Twin Borer is now available for continuous production at an 8-ton-a-minute clip.

The 1-CM Miner has a capacity of 4 tons per minute, is 45" high over-all, and will cut from 5½" below floor to 90" above (120" with special equipment). It is available with two hydraulic roof drills of 4200-lb. thrust (note the photograph above) making the 1-CM a fully integrated unit capable of handling both advance and roof control.

The Joy "Ex-Belt" Conveyor (see drawing above) now permits a continuous mining machine to operate *almost without interruption* in driving rooms and entries up as far as 1000 feet, including breakthroughs and taking pillar on retreat. It is available in 24, 30 and 36-inch widths and consists of two main units: a drive and a tail section with bridge conveyor, both self-propelled on identical crawler treads.

The "Ex-Belt" extends or retracts 50 feet while operating under full load. Belt tension and slippage are under automatic control at all times. A 100-foot length of belt can be added or removed, as needed, in an average time of only 5.3 minutes; and the entire system can be moved over and set up for a new heading in less than 2 hours.

. . . FIRST, went up 40%

when a JOY I-CM Continuous Miner was used instead of conventional methods

THEN, increased 38% more

when a JOY Extensible Belt Conveyor was added to provide continuous haulage

	1 MONTH'S RUN I-CM MINER ONLY	2 MOS. 20 DAYS' RUN I-CM MINER-"EX-BELT" COMBINATION
TOTAL PRODUCTION (RAW COAL)	17,818 TONS	51,253 TONS
TOTAL SHIFTS WORKED (TWO ON- ONE OFF)	39	107
AVERAGE PRODUCTION PER SHIFT	457 TONS	479 TONS
BEST PRODUCTION SHIFT	650 TONS	831 TONS
WORKING CREW CHARGED TO THE EQUIPMENT PER SHIFT	8½ MEN	7 MEN
AVERAGE PRODUCTION PER MAN PER SHIFT	53.8 TONS	68.4 TONS

The results above cover two regular periods of operation in a West Virginia mine. The coal is in the Pittsburgh seam and averages about 8 feet in thickness. It contains numerous clay veins up to 4 feet thick, resulting in both bad top and bottom when encountered, and requiring the hauling of considerable waste material. Mining height is limited to about 7 feet, leaving some head coal for roof support, and some bottom because of impurities.

In the first operating period of a month, the Joy 1-CM Miner was teamed with two Joy 10-SC shuttle cars unloading on belt conveyors. Production per man-shift averaged 53.8 tons, *an increase of 40% over conventional mining methods.* Size consist also improved with 1-CM production, with the sizes over 3/8" increasing from 69.1% to 74.7% of the total, on the average.

In the second period of nearly three months, a Joy "Ex-Belt" Conveyor replaced the shuttle cars. *Production per man-shift jumped to 68.4 tons, an additional increase of 38% and a total increase of 78% over the methods previously used!*

What would results like these do for *your* profit margin? Let us help you to secure real cost reductions under today's conditions, with rugged, field-proved equipment that is built to stay on the job. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&D CL 8736

COST-CUTTING MEMOS:

SPOT THE DRILL HOLES RIGHT: Drilling, drill patterns, and spacing are vital factors in reducing explosives costs. In hand-steel days, each hard-won hole was carefully planned to gain maximum breakage and to pull the entire length. Today, careful supervision should be employed to avoid bootlegs and poor fragmentation which result from hasty, unplanned drilling.

USE THE RIGHT SIZE CARTRIDGE: It's costly to tie up manpower arguing with stuck cartridges. Be sure you are getting the proper diameter for easy loading. In small diameter holes, take bit wear into consideration in ordering your explosives, reducing diameter of cartridge accordingly. Redi-Slit® cartridges can give both compaction and trouble-free loading.

USE ENOUGH STEMMING: Large diameter holes take a lot of explosives—too much for you to write off the waste of energy which results from "blown-out" shots due to insufficient stemming. Initiation with electric blasting caps at the point of maximum confinement also helps to put the explosives gases to full and profitable use in both large and small diameter holes.

COMPARE MILLISECOND DELAY RESULTS: Organized tests can show what may be achieved with millisecond delay shooting and which pattern gives best results. Check benefits not only in stoping, but also in drifts, raises, and sinking shafts. Open pit operations should compare progressive and alternate patterns. Sequence photos can show rock movement.

BETTER BLASTING is a combination of the right explosives plus the right methods. The economy and flexibility of fixed explosives in blasting operations have been firmly established. Here are a few of the many ways you can cut costs even further in both open pit and underground work . . . and aid the productivity of your loading crews. If your blasting methods haven't been checked lately, why not call your nearby Atlas representative? His suggestions may help you cut costs—and increase production, too. And write us if you'd like to receive the free, informative periodical "Better Blasting," published quarterly by Atlas to bring you technical tips and product announcements.

ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY,
WILMINGTON 99, DELAWARE

Offices in Principal Cities

WHAT HAPPENS
IN THE NEXT FEW SECONDS
DETERMINES A BUCKET'S *VALUE* TO YOU

If it's a Page Automatic . . . it starts digging sooner . . . fills faster and carries out more material than any other bucket

The first few seconds after a dragline bucket lands in the pit tells the story of its productive capacity and *actual value to you.* If the bucket digs in instantly at the first pull of the load line . . . if it fills completely in 1½ to 2 lengths . . . and carries out its full rated capacity-it's a good bucket.

And if it will do this day in and day out, year after year, chances are it's a Page Automatic. No other bucket has the automatic digging action, loading speed or carry-out capacity of a Page . . . no other bucket will give you the production that a Page will give you.

Let us prove our point. We'll put a Page Automatic on your machine—let your operator run the test and *you* be the judge. There's no obligation. Ask your nearby Page Distributor for full details today. Write for Bulletin GPB-454.

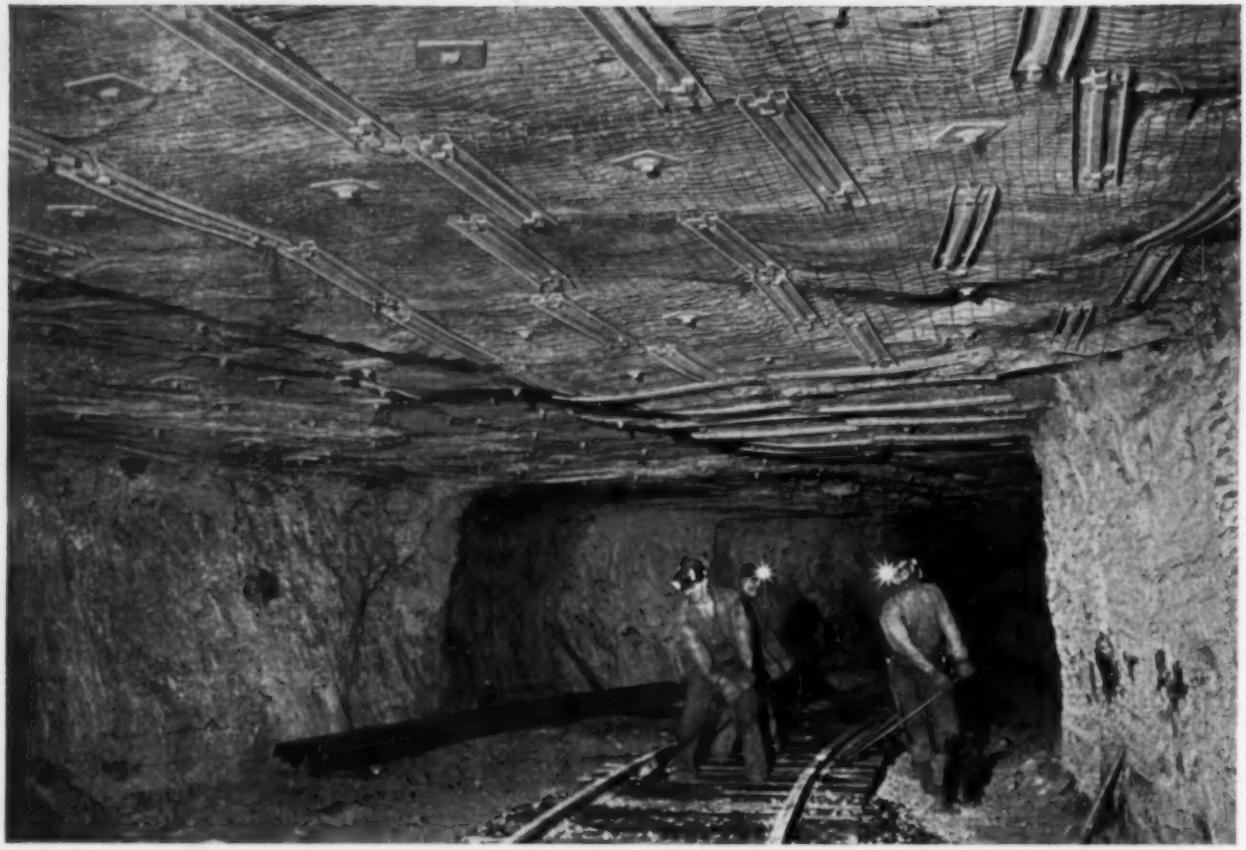
Page

Automatic Dragline Buckets
Walking Draglines

If it's a PAGE *... It* DIGS

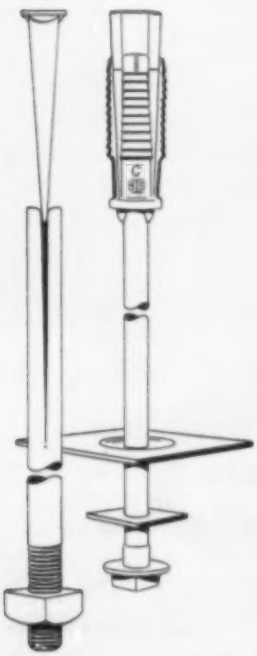
B-3104

PAGE ENGINEERING COMPANY • Clearing Post Office, Chicago 38, Ill.



In this installation, Bethlehem Roof Bolts are used with plate washers, steel roof ties, and wire mesh, to provide sound roof in a mine haulageway.

Roof Bolting Promotes Safety... Makes Mines More Productive



Your mine becomes a safer place for men to work when roof bolts are used for roof support. Not only that, production goes up, too, as there's hardly any time lost due to serious roof falls.

Bethlehem Roof Bolts promote safety and help to increase production because they do such an effective job of replacing old-fashioned, bulky supports. They bind layers of strata into self-supporting thick beams, and are particularly effective when used with steel roof ties.

Described here are four types of Bethlehem Roof Bolts, any one of which can contribute greatly to your safety program. For full details, write to us at Bethlehem, Pa.

SLOTTED BOLT This husky 1-in. bolt is ideal for troublesome roofs, as well as pillar bolting. The central slot is forged, without loss of metal. Opposite end of bolt has 5 in. of rolled threads. Steel wedge, started in slot when bolt is placed in 1¼ in. hole, is forced deep into slot when bolt is driven, spreading bolt-ends.

SQUARE-HEAD BOLTS (Three Types) Bethlehem makes three types of headed roof bolts for use with expansion shells: (1) a ¾-in. carbon-steel bolt, with typical breaking load of 24,000 lb, (2) a ⅞-in. high-strength bolt, also with typical breaking load of 24,000 lb, and (3) a ⅞-in. high-strength bolt, with a typical breaking load of 45,000 lb.

HARDENED WASHERS Bethlehem hardened washers, used with headed bolts, prevent galling or tearing of metal because they reduce friction occurring between the bolt head and roof plate when high tension in the bolt causes excessive bearing pressure. Bethlehem also produces a full line of mine roof plates, roof ties, expansion shells, and plate washers.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

FAIRMONT *makes the* DIFFERENCE . . .

In up-grading your coal product *ECONOMICALLY!*

Fairmont is the modern approach to coal preparation . . . an approach based on coordinated planning to achieve increased separating efficiency at low operating economy.

With Fairmont built preparation plants . . . here's the difference . . .

- Let Fairmont provide the difference in upgrading your coal product. Fairmont-built preparation plants guarantee product uniformity and over 99% separating efficiency through a wide product size range of ⅛" to 10" in any tonnage capacity.

Call a *Fairmont* Engineer!

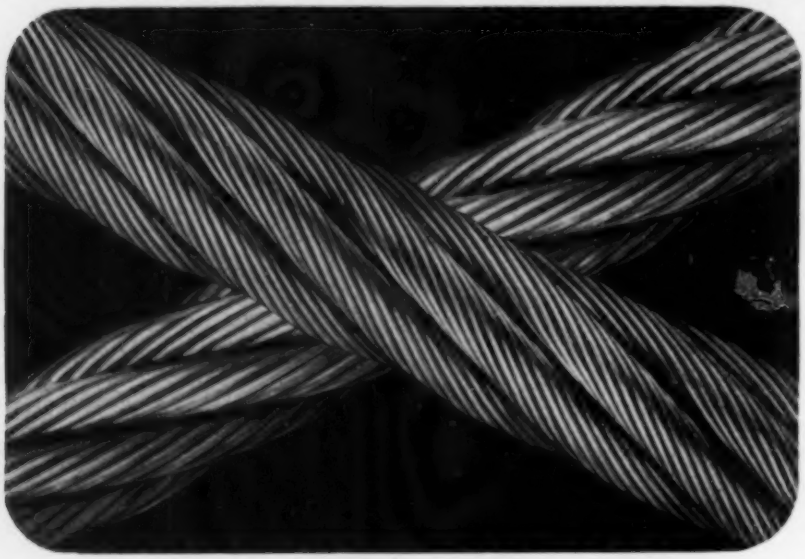
1. Planned, qualified design, engineering, fabricating and erecting services.
2. Independent selection of equipment best suited to specific requirements.
3. Skilled pilot crews train your own crews in efficient operation.
4. Each installation designed to meet present and future requirements.

FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

DESIGNERS AND CONSTRUCTORS OF COMPLETE COAL PREPARATION PLANTS USING BOTH WET AND DRY CLEANING, CENTRIFUGAL AND THERMAL DRYING.

FIRST WE DEVELOPED 1105 ROPE WIRE.



THEN WE MADE ROEBLING'S

Royal Blue

WIRE 1105 ROPE

1105 takes Royal Blue out of the ordinary wire rope class.

1105 is a rope wire that's new – that's stronger. It's the biggest news in many years.

1105 is the result of more than a century of research and development – it's the wire that gives Roebling Royal Blue the stamina that pays off in service.

Contact your Roebling distributor or write us for the full story.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

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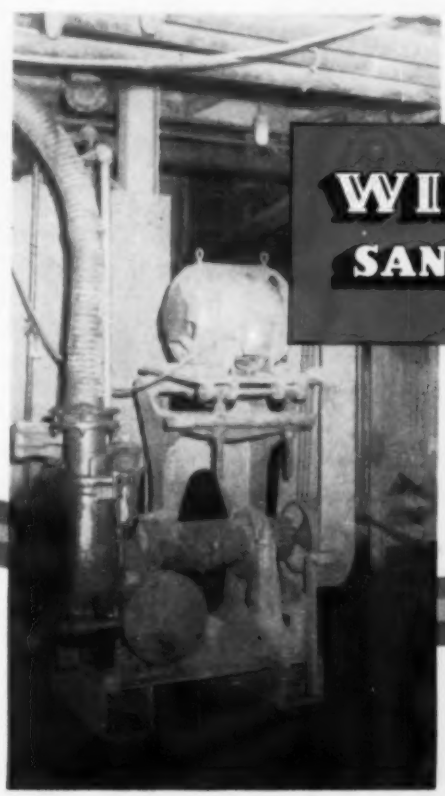
Pioneering in TACONITE

The future of American industry is closely allied with the economic processing of low-grade iron ore reserves in Minnesota and Michigan. Because of taconite's vital importance, industry is highly interested in the progress of the TACONITE PIONEERS.

Shown here is a typical example of how one taconite pioneer uses Wilfley Sand Pumps to help solve the problems encountered in handling flotation froth . . . proof again that on even the most difficult applications Wilfley Pumps meet every requirement.

Individual engineering on every application. Write, wire or phone for complete details.

Wilfley Acid Pump
"COMPANIONS IN ECONOMICAL OPERATION"
Wilfley Sand Pump



WILFLEY SAND PUMPS

A. R. WILFLEY and SONS, INC.
DENVER, COLORADO, U.S.A.
New York Office: 1775 Broadway, New York City

ANOTHER COMPLETELY NEW
PAYLOADER®

Biggest Yardage Producer In Its Class

COMPLETE Power-Shift Transmission

Makes ALL Shifts WITHOUT Stopping!

This "PAYLOADER" has a newly-developed power-shift transmission which is the easiest-operating, fastest-acting, most efficient ever put into a tractor-shovel. Shifting from *any* speed range to *any* other is accomplished instantaneously by fingertip action — *on the go* — there's no stopping, no "clutching". Directional shift (forward and reverse) is just as easy and just as fast. All speed ranges are provided in reverse as well as forward. Also included is a highly-efficient polyphase torque-converter that matches engine speed and torque to the load *instantly* and multiplies the engine torque up to 350%.

• with more digging power
• with faster operating cycles
• with easier, safer operation

YOU'VE never seen anything like this big new "PAYLOADER" — because there *is* nothing else like it. Nothing else like it in design — nothing like it in performance.

No other tractor-shovel gives you the tremendous digging power; the ability to get and keep heaped bucket loads under all conditions; the *complete* power-shift transmission which speeds operating cycles; the balance and stability to handle big loads fast, safe and easy.

If you want big, steady output — dependable performance hour after hour, put this husky HO on your jobs and you'll see the difference. Stop in at your nearest "PAYLOADER" Distributor and look it over.

HOUGH-DESIGN HOUGH-QUALITY

Safety and Stability. Special boom-arm shape and positioning keeps moving members out of operator's reach at all positions. Close, low, load-carry position and longer wheelbase provide stability and balance for fast maneuvering — with safety.

More Horsepower per bucket capacity than other standard models. Either gasoline or diesel power available.

Easy to Operate. Fullest operator visibility for safe, fast maneuvering; power steering; power-shift — no "clutching"; 4-wheel hydraulic brakes — vacuum boosted; foam rubber molded seat and back cushions; seat adjustable for operator comfort; longer wheelbase adds to rider comfort.

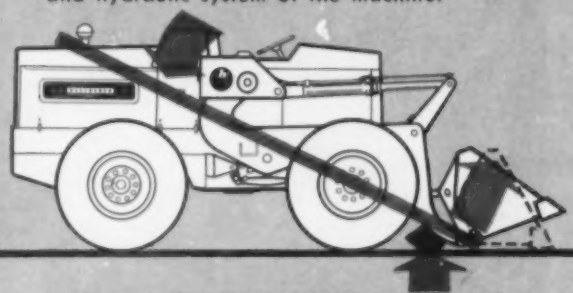
Superior Hydraulic System. Sealed, pressure-controlled hydraulic system to keep dirt and air out of oil; double-acting, long-life hydraulic rams with chrome-plated piston rods, and highest quality oil lines and fittings.

Fully-Equipped. Standard equipment includes: built-in headlights, back-up lights and tail lights; 12 volt electrical system for gas-powered units.

Extra Equipment for Greater Usefulness. Bulldozer blade, special buckets, bucket teeth, crane hook and lift fork attachments; snow plows, backhoes and many other useful and special accessories will be available.

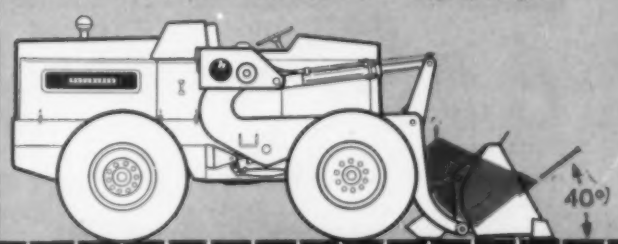
POWERFUL PRY-OUT ACTION

Tremendous pry-out force is obtained by using the breakout pads on the ground as a fulcrum for leverage. The load forces opposing the pry-out action are thus transferred to the ground through the pads instead of to the axle, wheels and hydraulic system of the machine.



40° BREAK-OUT AT GROUND LEVEL

You can get HEAPED BUCKET LOADS and you get them FASTER and EASIER WITH THIS NEW BUCKET ACTION. Most important of all — you KEEP BIGGER PAYLOADS — because the bucket can be tipped back a full 40 degrees at ground level before it is raised, eliminating spillage.



THE FRANK G. HOUGH CO.
735 Sunnyside Ave., Libertyville, Ill.

Send full information on the new Model HO, 2-cu. yd. "PAYLOADER"

NAME .....

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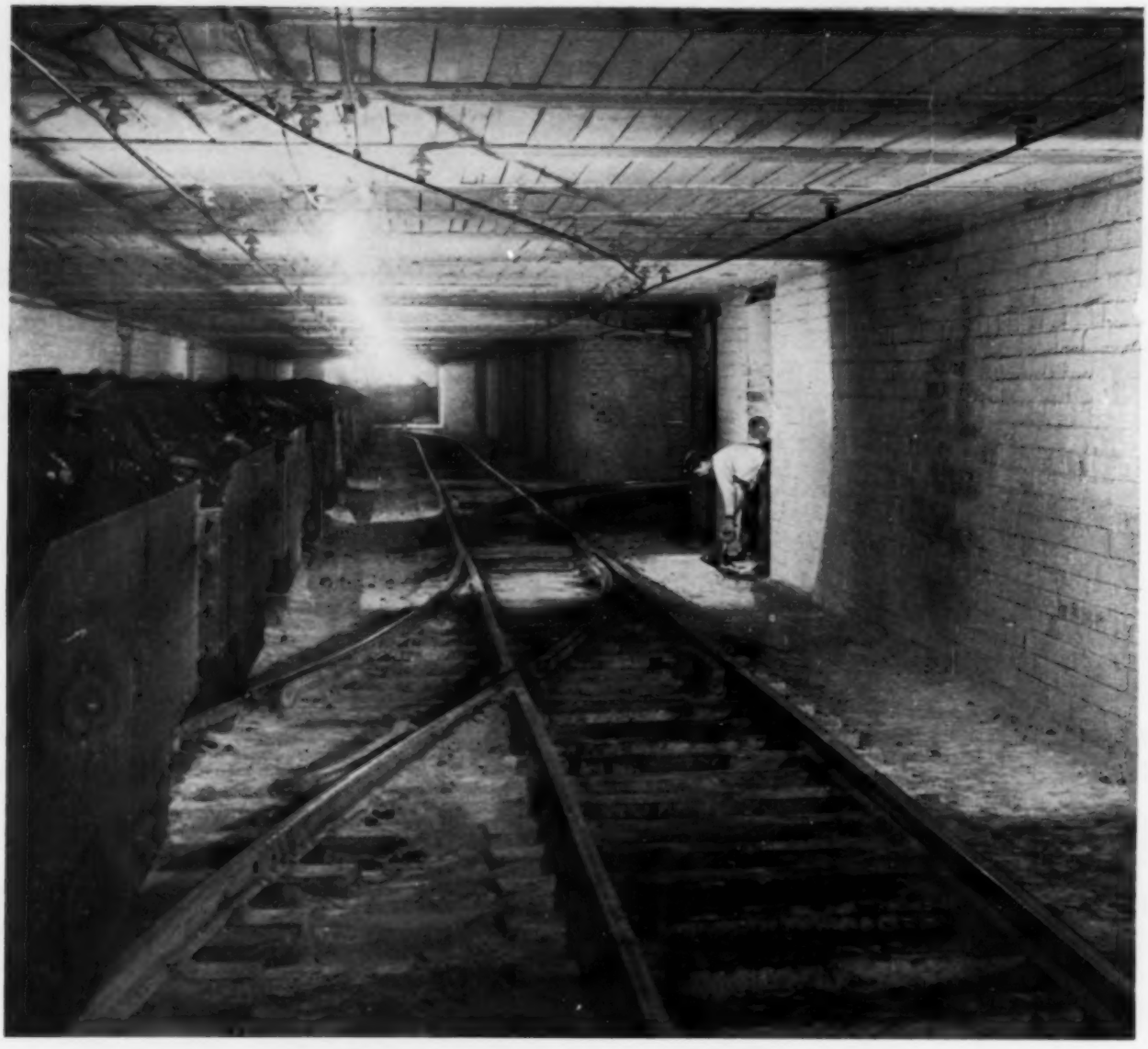
PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY



They really haul big payloads here

In this large Pennsylvania mine you'll find a prime example of modernization at work. Everything here reflects long-range planning, from the high-capacity cars to the heavy rail they roll on.

And it *is* heavy rail, in the 60-lb-and-over category. Like many another outstanding haulageway, it was Bethlehem-designed and Bethlehem-built. King-size payloads will travel smoothly over this line for many years to come.

Bethlehem mine track specialists stand ready to pitch in on your modernization program, too. At a word from you they will inspect your workings, study your problems, then work out a plan that will efficiently fill the bill.

Once you have approved the drawings your track will be manufactured and completely pre-assembled at our plant, before a single spike is shipped to your mine. Every curve, every turnout and every crossing will have been fitted into place to simplify installation at the final site.

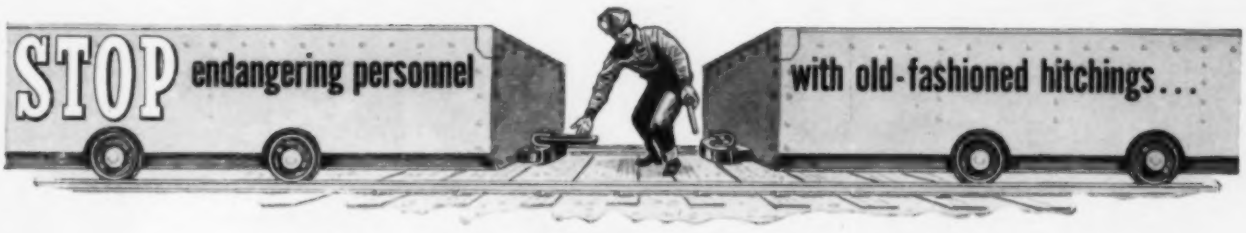
Contrary to what you may be thinking, such a Bethlehem layout is not a luxury. Many mines have found that Bethlehem track soon pays for itself in operating economies. We'll be glad to discuss details with you. Just tell us where and when.

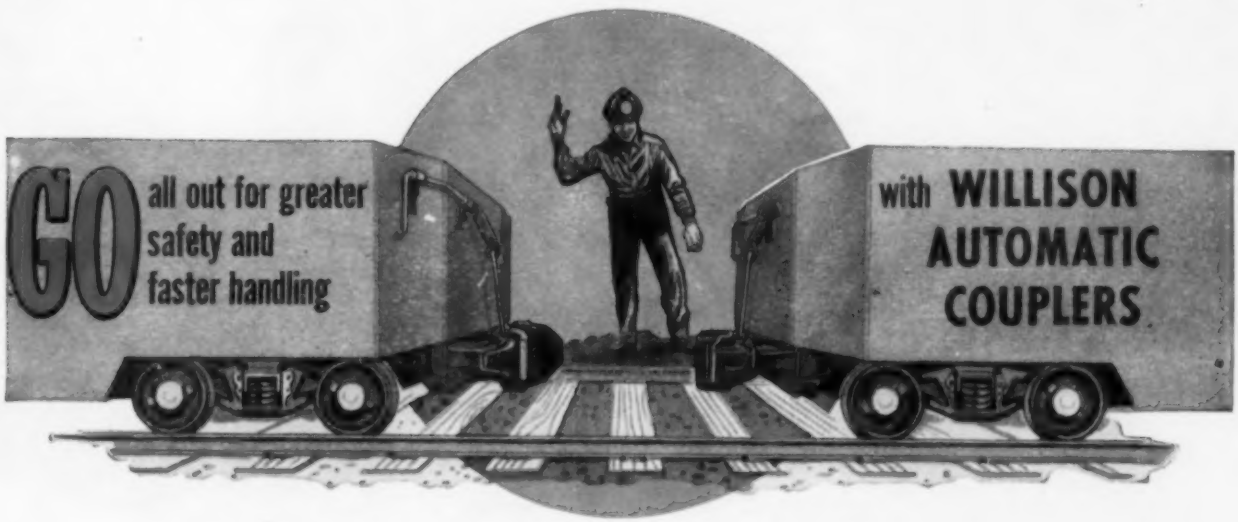
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL





With Willison Automatic Couplers there's no need for personnel to go between cars to couple or uncouple. That means safety—and faster handling because Willisons uncouple from either side. All Willisons couple with each other automatically—there's no matching of coupler heads.

For safety, faster handling and larger tonnages—Willison Automatic Couplers and National Multi-Pad Rubber Draft Gears.

A-3031

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

WILLISON AUTOMATIC COUPLERS • RUBBER & FRICTION DRAFT GEARS • NC-1 CAR TRUCKS
NACO STEEL WHEELS • NACO STEEL LINKS & SWIVEL HITCHINGS

"It's easier on **'tender'** roofs!"

AIRDOX

NON-EXPLOSIVE MINING METHOD

Cuts Costs 5 Ways

- Produces less fines in face preparation
- Rolls coal forward for faster, easier loading.
- Easier on "tender" roofs—cuts shoring, bolting
- Lowers cleaning costs by minimizing fines
- Reduces degradation—no shattered coal

Airdox reduces roof problems–it leaves a "tender" roof in a firm condition. The powerful, yet gentle Airdox "push" is directed down and outward. There is no shattering upward shock to loosen a "tender" roof. Timbering and bolting costs are reduced and the working face is left safe and sound.

This is one of the several reasons why Airdox is the most economical method known for face preparation. It will reduce your costs in the mine and in the tipple. Write for a free survey and we will demonstrate how your mine can profit with Airdox.

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

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Pikeville, Kentucky
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Louisville, Colorado
Phone: Boulder
Hillcrest 2-7298

Library, Pennsylvania
Box 427
Phone: Library Colonial 3-6910

Camden-on-Gauley, W. Va.
Phone:
Camden-on-Gauley 2181

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307 Northwest Fifth St.
Phone: Evansville 2-8944

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Phone: Ottumwa
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RECLAIM FINE COAL WITH ECONOMICAL EIMCO FILTERS

Dewatering and reclaiming fine coals is an economic must for reasons that vary with the community in which the coal is produced. In practically every area more than one of these reasons will apply:—

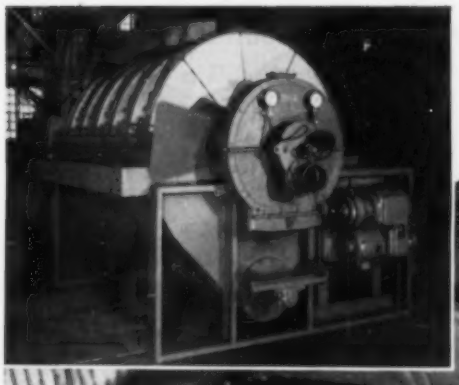
1. Restricted disposal areas prevent use of lagoons.
2. High pumping and labor costs for cleaning existing sludge lagoons.
3. Production of higher percentage of coal fines with continuous mining machines.
4. Stream pollution laws becoming more stringent.
5. Water shortage.

In every case, Eimco filters used in connection with existing plant equipment will represent a comparatively small investment for delivering a product to increase the salable tonnage of the plant.

Eimco filters will handle the fine coal dewatering on a continuous basis and pay for themselves in a very short time.

A copy of the paper on "Theory and Practice of Continuous Filtration of Fine Coal and Slimes" (Silverblatt & Dahlstrom) presented to the Second International Coal Preparation Congress may be obtained on request — please use your company letterhead.

Eimco Agidisc Filter used in many plants for dewatering fine coal. Below: An Eimco Disc Filter at work on dewatering coal fines. Note, even cake formation for uniform drying and greater tonnage.



THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-131

Profits start in the Pit!

Their dependable performance and high job availability, combined with big payload capacity and fast travel speeds, have made "Eucs" the preferred hauling equipment for open pit operations in both the anthracite and bituminous fields. Because they're built for tough off-the-highway service, Rear-Dump and Bottom-Dump Euclids make more profits for owners by cutting the cost of hauling coal, overburden and mine waste.

Your Euclid distributor can show you the way to lower hauling costs... have him provide a hauling production and cost estimate for your operation... there's no obligation, of course, so get in touch with him soon.

In the anthracite fields of Pennsylvania Rear-Dump "Eucs" outnumber all other makes of off-the-highway units combined... more than 800 of them are working in these open pit mines. Because of their unequalled record of high production and low hauling cost, it was only logical "Eucs" were selected by Wadesville Production Co. Twenty of them, ranging in size from 22 to 34 ton capacity, are at work on this huge stripping operation.

* See Euclid's complete line at General Motors POWERAMA—the World's Fair of Power—Soldier Field Chicago, Illinois. August 31 through September 25.

Maumee Collieries Co. of Indiana uses four 40-ton Euclid Coal Haulers to haul from the pit to the plant at Mine No. 28 near Jasonville. Loaded haul of 5000 feet takes just over 4 minutes and a complete cycle, including loading which requires 4.4 minutes, is made in 16 minutes or less. "Eucs" are also working at two other mines of this big producer... Maumee has been a Euclid user since 1946.

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

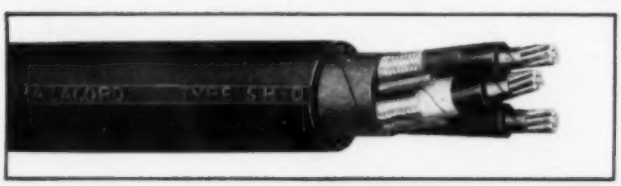
GM GENERAL MOTORS

the care and feeding of electric shovels

Nothing brings out the beast in an electric shovel more than getting it "off its feed." Deprive it of a steady diet of electricity, and it will drop its ugly head and go temperamental on you.

Sensible, well-trained shovels insist on Hazacord Portable Cables for dependable power supplies. They know Hazacord Shovel Cables are electrically and mechanically strong to withstand all rugged mining service as well as approved for flame-resistance under the rigid requirements of the Federal Bureau of Mines and the Pennsylvania Department of Mines.

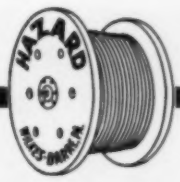
Hazacord Shovel Cables are available in six standard types for use up to 15,000 volts. They are protected by a Hazaprene



ZBF sheath which has been cured in a continuous metal mold to assure: *1. optimum vulcanization; 2. maximum density; 3. lasting toughness; 4. smooth, wear-resisting surface; 5. controlled diameter; 6. resistance to mechanical abuse.*

Keystone heat-, moisture- and ozone-resisting insulation provides maximum electrical protection, and extra-flexible conductors insure easy, kink-free handling and added service life under constant flexing.

Write for your copy of the Hazard Mining Cable Catalog, Bulletin H-450, and check over the Hazacord construction that will keep your mining machinery contented. Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, N. J.



HAZACORD

mold-cured portable cable

PRODUCT OF OKONITE RESEARCH

2417

IN HIGH ROOF AREAS, such as main haulage ways, where a permanent anchor is required, Republic's Forged Wedge Head Bolt Assembly is ideal. It is also particularly suited for use in tunnels, hillside cuts, foundations and other permanent installations. This is the strongest roof bolt assembly made. Installation is easy. The hole need not be drilled to a predetermined depth. It need only be longer than the bolt.

FOR YOUR HIGH OR

WEDGE HEAD FEATURES—The wedge is forged as an integral part of the bolt. Deep, sharp serrations provide positive holding power. Steep angle of wedge assures positive anchor. Rubber washer on wedge insures an immediate anchor in oversize holes.

BOLT SHANK FEATURES—The bolt is not twisted in tightening operation. This eliminates the danger of setting up internal torsional stresses and the possibility of twisting the bolt in two. Bolt has a full four inches of rolled threads. Exposed threads below bearing plate provide a fastening point for other equipment. Available in ¾″ diameter low- or high-carbon steel to any specified length.

Republic Mine Roof Bolts

These bolts have been thoroughly tested in Republic's own mines, in all types of strata and have been proved safe and dependable for bolting in any type of roof at any height.

Republic Roof Bolts are backed by more than 100 years of skill and experience in the manufacture of all types of fasteners. And, because Republic uses its own ore, makes its own steel, controls quality at every stage of production, you are assured of roof bolts of the highest quality and dependability.

HIGH STRENGTH, TOUGHNESS, CORROSION-RESISTANCE—three features of Republic High Strength Steels—mean longer life for mine cars, particularly in heavy, abusive service. And when these cars or other mobile equipment are designed and engineered to take full advantage of Republic High-Strength Steels, weight savings up to 50% are possible. Republic offers two booklets on high-strength steels. Send the coupon for your copies.

UNDERGROUND OR ON THE SURFACE, Republic Flexible Plastic Pipe licks corrosive mine waters. Chemically inert, immune to electrolytic action, it stubbornly resists acids, alkalies, metallic salts and other corrosive wastes. Republic Flexible is easy to handle, easy to join. Only tools needed are screwdriver, knife or handsaw. Available coiled from your Republic Distributor in diameters ½″ through 3″—in straight lengths in 4″ and 6″ diameters.

IN LOW ROOF AREAS, where every inch of clearance counts, Republic's Square Head Roof Bolt with the Wedge Nut and Shell Assembly is recommended. This type provides maximum head room for continuous mining machines and their operators. Protruding threads below the bearing plate, so often a hazard in ceiling areas less than five feet high, have been eliminated. Bolts and bearing plates are recoverable.

LOW ROOF AREAS

Provide Safe, Efficient Bolting

Whatever your roof bolting problem, Republic's Bolt and Nut Division has the answer in the largest combination of roof bolt, roof plate and expansion shell assemblies available to the mining industry.

For complete details on the Mine Roof Bolt Assemblies illustrated on these pages, mail the coupon for Mine Roof Bolt Booklet #569. It also contains information on materials, packaging, installation, other assemblies, how to order.

WEDGE NUT AND SHELL ASSEMBLY FEATURES—Provide the strongest anchor of all expansion-type shells. Greater total expansion is obtained. More shell area is in contact with the hole wall. Rubber washer around wedge nut gives strong initial grip and eliminates shell turning in hole.

SQUARE HEAD BOLT FEATURES—Installed rapidly with either stoper or auger. Head and washer forged as one piece. Head is unchamfered for snug wrenching. Furnished in ⅝" dia. in high- or low-carbon steel with American Standard Regular or Heavy Head. Also in ¾" dia., high- or low-carbon steel with American Standard Regular Head. Bolt length in inches is marked on bolt head. High-carbon steel bolts marked R-40 on head.

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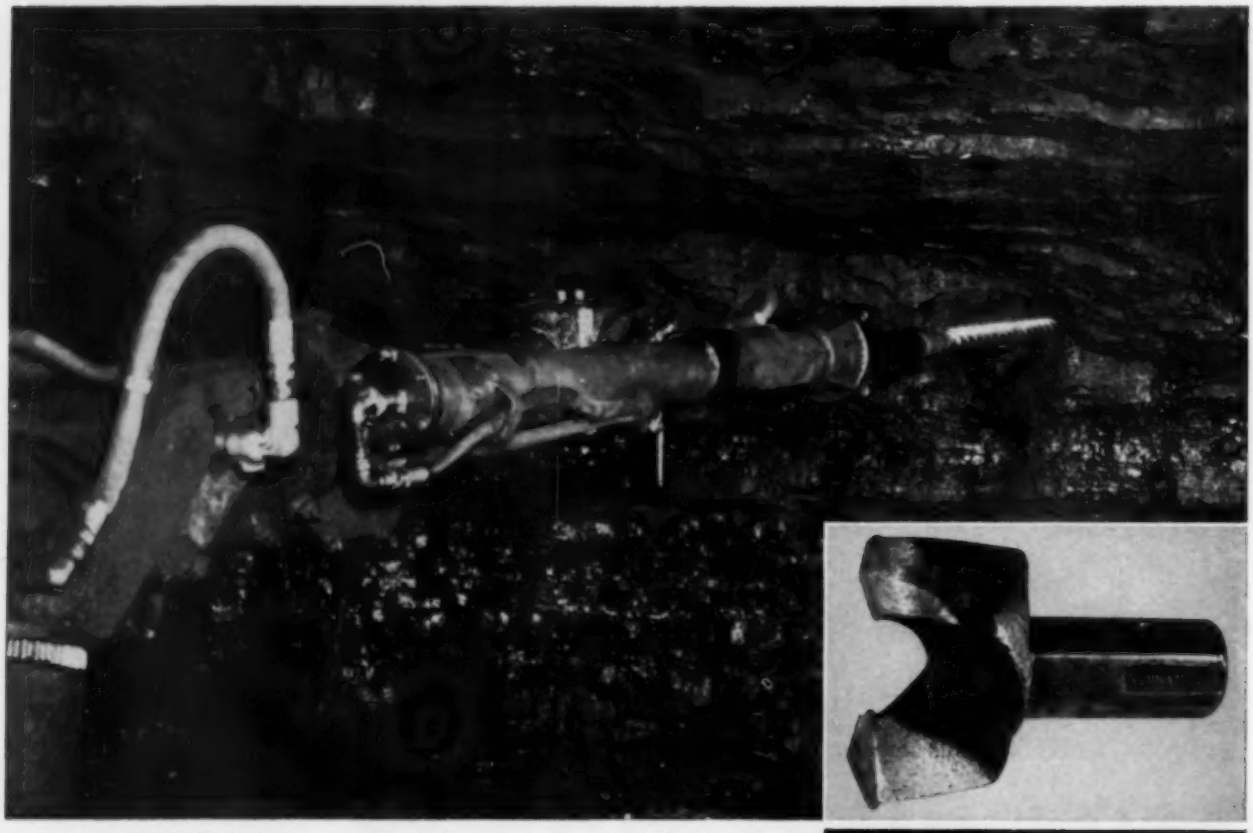

This is the Kennametal DB-3 bit used at Gem Coal Company, which gave over 10,000 feet of drilling at a bit cost of 1.2 mills, using a variable speed, variable thrust Jeffrey 56-FHR single arm, rubber-mounted drill.

1706 six-foot holes drilled with a Kennametal* DB-3-Inch Bit

"One third longer service with Kennametal drill bits than any other carbide bit that has been used" . . . reports Herman Jauchius, Superintendent of Mine 255, Gem Coal Company, Nelsonville, Ohio.

As a typical example performance in this mine, a Kennametal DB-3 bit completed 1706 six-foot holes or more than 10,000 feet of drilling in Hocking Seam No. 6 with 28 regrinds. Drilling speed per six-foot hole, using a Jeffrey 56-FHR drill, averaged 20 seconds.

Approximately 190 places, 26 by 6 feet, are drilled per bit life, on an average, with production about 7100 tons of coal per bit. In terms of bit cost per ton, the Kennametal DB-3 bit cost $.0012 or 1.2 mills per ton of coal produced.

This is one example of why Kennametal bits are used so extensively. Try them in your operation and cut bit costs per ton of coal. Your Kennametal representative will help you put the right tool on the job. Call him today, or write to KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

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Mr. Jauchius and face boss Fuller examine Kennametal drill bit, which has given long service and low bit cost per ton.

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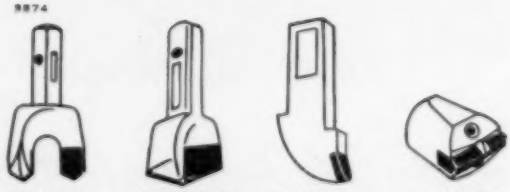

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Two great LONG loaders

A low height, heavy-duty machine capable of continuous high-capacity operation, the LONG Model 88 Pigloader*, has been developed specifically for Piggyback* Conveyor Mining. It's built extra rugged to withstand hard usage, yet is readily maneuverable and simple to operate. Rated capacity: average—4 tons per minute; maximum—6 tons per minute. Height 26".

*Trade Mark

LONG Model 188 LOADING MACHINE

Equipped with a swing boom for loading into shuttle cars, this new loader offers the same superior operating features as the Model 88. Extensive operating tests indicate that the Model 188 will outperform any loader in its class on the market today. Rated capacity: average—4 tons per minute; maximum—6 tons per minute. Height—28". Also available—Model 198 with a capacity of 8½ tons per minute.

The LONG Design Features A Single 40 hp Electric Motor

- Simplicity of electrical circuit
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Developers and exclusive manufacturers of the Piggyback Conveyor System—America's fastest growing method of mining.

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I'm using Primacord

"You understand . . . I don't *like* thunderstorms. No blaster does. But ever since that job in Kentucky when a direct hit failed to detonate Primacord, I make it a point to use this detonating fuse during the thunderstorm season."

Here's the reason. Primacord is an insensitive detonating fuse. It is not affected by stray electrical currents. It cannot be set off by friction, sparks or ordinary shock. It must be detonated with a blasting cap.

Primacord is used to detonate the entire load in each hole, and to connect all holes in planned sequence to produce *good digging.* A detonating cap is attached to the Primacord only after everything is ready . . . when men and machines are out of the danger zone.

Use Primacord wherever there is danger of stray electrical currents — and particularly during thunderstorm seasons.

For more information see your Explosives Supplier, or write to

THE ENSIGN-BICKFORD COMPANY
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Primacord — Quarrycord — Ignitacord® Safety Fuse — Blasting Accessories
Established 1836

To connect a Branch Line of Plastic Reinforced or Plastic Wire Countered Primacord with the Trunk Line

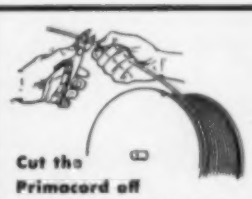
use this DOUBLE HITCH in the textile-covered Primacord Trunk Line. *Draw it up as tight as you can, and make sure that the Branch Line leads off at a RIGHT ANGLE to the Trunk Line.*

PRIMACORD®

DETONATING FUSE

PROVED AND APPROVED

P-21



Cut the Primacord off the Spool Immediately

Make this a safety habit! As soon as you have taken off the length of Primacord you need for a down-hole or for a trunk-line, *cut it off the spool! Don't waste a second — do it now!*

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use FRICTION TAPE. You can detonate Primacord with fuse and cap or electric blasting cap. Lay the cap alongside of the Primacord with the business end of the cap pointing in the direction that the Primacord will detonate. Tape the two snugly together, so that you have a tight connection.

To connect a Branch Line with the Trunk Line

Use this HALF HITCH for Plain and Reinforced Primacord. *Draw it up as tight as you can, and be sure the Branch Line leads off at a RIGHT ANGLE to the Trunk Line.*

To lengthen a Trunk Line

of Plain or Reinforced Primacord, tie a SQUARE KNOT. *Draw it up as tight as you can* — it won't slip back. Caution: don't use any knot in a hole — it might break or hang up explosives when loading.

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

Coal Age

AUGUST, 1955

IVAN A. GIVEN, EDITOR

Still Short

A SHARP DROP in residual-oil imports beginning the last week of March is an indication that the story of the coal industry and the independent oil producers is being taken seriously not only in some legislative and administrative quarters but also by the majority of the importers responsible for the rise in recent years. In April and May the residual importation rate was cut approximately 170,000 bbl a day, compared to the average for January, February and March. If maintained throughout the rest of the year, this cut would total the equivalent of over 11 million tons.

Favorable though this turn is, it still falls short of what the realities of the situation demand. The April and May cut still left the importation rate substantially higher than in the same months in 1954, with the result that the 5-mo total is well ahead of last year. This means that coal still is deprived of business because of lack of opportunity to compete. Attempts to insert a quota in the new Trade Agreements Act failed, unfortunately, but a "peril to national security" clause was finally incorporated, and the situation justifies an appeal for its invocation. Meanwhile, coal should keep a careful watch on import rates to see that, as a minimum of relief, the cuts of April 1 are at least continued if not deepened.

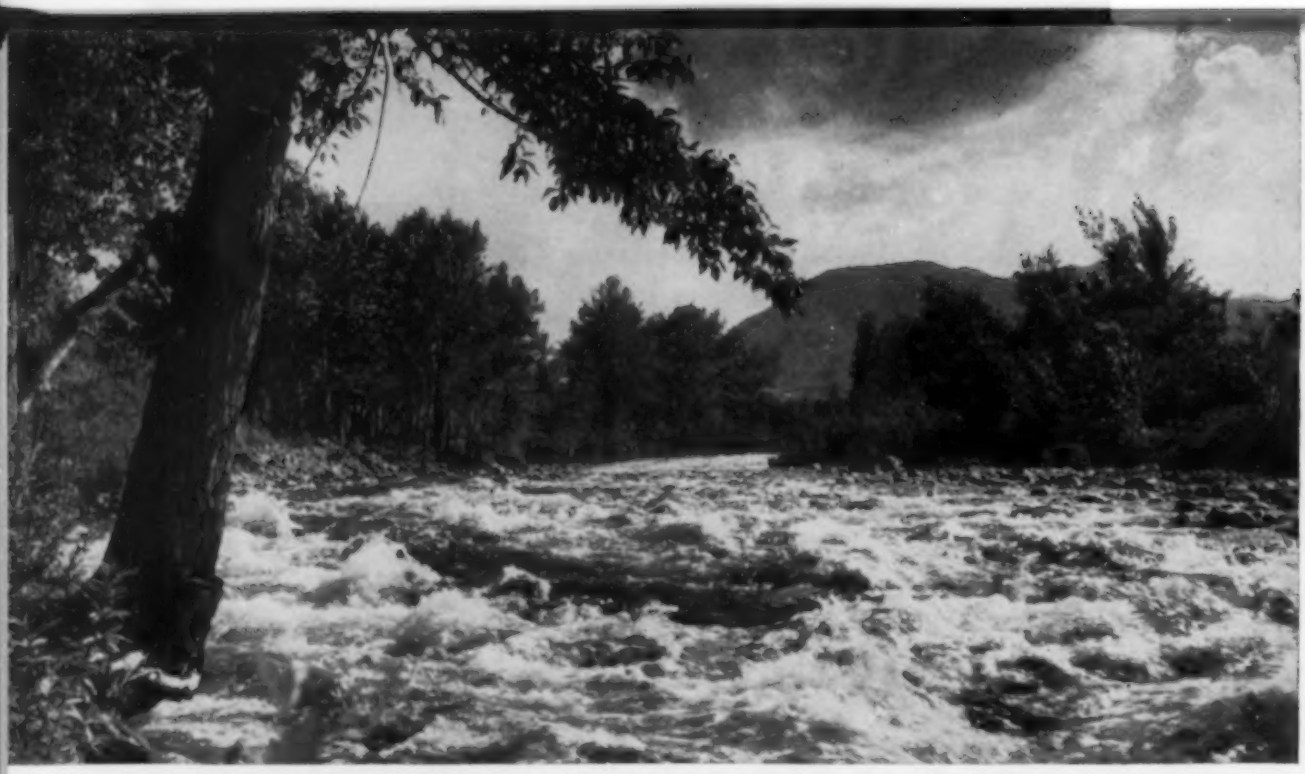
Selling Power

GROWING APPRECIATION of the value of the engineering approach as an effective market builder is reflected in the recent appointment of Julian E. Tobey Jr. as director of engineering for the Indiana Coal Association. In this position he will work toward the development of a broader market for Indiana coals through engineering advisory service to consumers and prospective users, and through collaboration with consulting engineers, architects and equipment manufacturers—incidentally following in the footsteps of a father who has done as much as anyone to prove the value of this approach as a part of a modern merchandising program.

By this move, the Indiana producers build up their striking power on the sales front and put themselves in better position to capitalize on the favorable trends becoming more and more evident. One, as noted in these pages previously, is the declining competitive power of oil and gas in most markets, paralleled by a growing appreciation of the merits of coal. The latter, for example, made it possible for the Canton Stoker Co. to advertise in July 57 recent coal-fired school installations in 12 states across the Nation from New York to Washington, with Alaska to boot, all "specified by leading architects and engineers." Stepping up industry effectiveness on the sales front, as Indiana has moved to do, will both build up and build on this growing inclination toward coal.

How Much?

WHAT COAL BUYS is going to be higher-priced in the not-too-distant future. This includes labor, supplies and equipment, and is the inevitable result of the present round of wage and price increases in other industries, whether justified or not. Since machines will cost more, and likewise labor to run them and supplies to keep them functioning, the pressure on operating management to make them produce more will increase. What are the answers? One is a determined effort to find out how much a machine or a man should do, because it is almost axiomatic that until such a study is made production and efficiency fall short of what should be obtained. Output standards, properly and carefully developed, are the foundations of maximum efficiency.



THE NATION'S GROWING CONCERN over its water resources has brought both problem and opportunity to coal. The problem is to minimize the drainage of wastes that render streams unsuitable for municipal, industrial and recreational use. In it is great opportunity to generate public confidence over coal's interest in community and national welfare.

Stream Protection . . . Coal Problem and Opportunity

Coal's stake in cleaning up streams, the trend of legislation on pollution control, what coal can do now to cut down on drainage of wastes, and the outlook for research on the acid enigma.

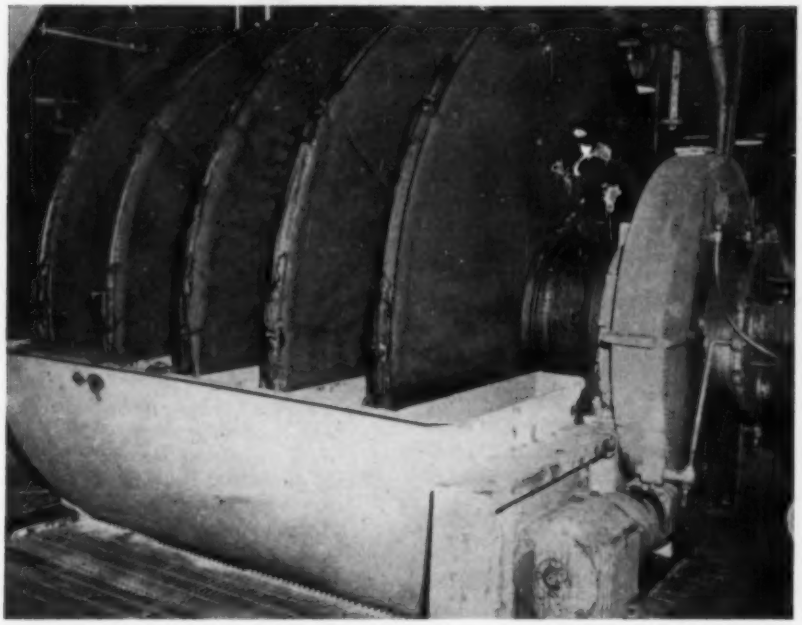
By W. A. RALEIGH JR.
Assistant Editor, COAL AGE

LOOK FOR STRICTER REGULATION of the discharge of water and wastes from coal mines and preparation plants into the streams of the United States. Mine operators have a real stake in anticipating this development. Aside from minimizing or eliminating suits and punitive action, industry participation in sound pollution controls is the best assurance that it will not be saddled with unwise and costly legislation. In addition, coal stands to benefit not only from savings in replacement of corroded pipe, pumps and other equipment, and in the recovery of salable coal from preparation plant discharges but also in its standing with the public. Positive identification with a sound program aimed at minimizing the discharge of acid, sludge and slurry into streams would be no little public-relations achievement.

That stronger curbs on coal wastes are coming is reflected in the pollution-control movement fast taking hold of the country. From Maine to California, and from Florida to Washington, states are enforcing or proposing new legislation aimed at reducing to acceptable standards the drainage of sewage and industrial wastes that "poison" streams and make them unsuitable for municipal and industrial use. Here is a sampling of pollution-control developments reported from various states during the past 6 mo:

OHIO VALLEY—ORSANCO (The Ohio River Valley Water Sanitation Commission) adopted its first formal statement of policy and procedure on industrial waste control April 6, 1955. Generally, the policy aims to carry out a statutory provision in the interstate agreement that all waters are to be "free from unsightly or malodorous nuisances due to floating solids or sludge deposits." Commenting on the policy statement, W. W. Jennings, ORSANCO chairman, said: "Having achieved unanimity of approach (with a 150-member industry action committee), we are now in a position to expedite industrial waste control in the same orderly and effective fashion that municipal sewage requirements were established by the commission on the Ohio River." (ORSANCO represents West Virginia, Virginia, Pennsylvania, Ohio, New York, Kentucky, Indiana and Illinois.)

MISSOURI—A proposed bill would create a new water pollution control board for setting standards of allowable discharges. Permits for new in-



REGULATORY BODIES have stressed drainage control of washery solids. Among several methods available is use of disc filter above. Research men feel confident that problems of acid mine drainage will also be solved.

dustrial waste and municipal sewage disposal units would be issued, subject to revocation by the board if standards were violated.

COLORADO—Proposed state legislation seeks to establish minimum standards on pollution, to set up procedures for enforcement and to provide penalties for violation.

MONTANA—A bill has been passed providing for the creation of a new seven-member State Water Pollution Control Council to control, prevent and abate pollution of surface and underground waters.

WASHINGTON—Both branches of the legislature have approved a bill requiring commercial or industrial firms to obtain a permit from the State Pollution Control Commission before discharging solid or liquid waste material into lakes, streams or salt water. The commission can specify conditions for disposal of waste to avoid unnecessary pollution.

KANSAS—Cracking down on 10 cities and industries which failed to comply with previous board orders to stop polluting Kansas rivers and streams, the State Board of Health directed its secretary, Dr. Thomas Hood, "to arrange early compliance."

Congress also is taking action. Bills have been introduced in both the House and Senate (H. R. 5296 and S.890) to extend and strengthen the federal water pollution control act (Public Law 845). The Senate bill has been passed. It authorizes an appropriation of $2 million annually for grants of financial aid to state or interstate water pollution-control agencies. Heavy emphasis is placed on federal assistance in technical and research matters. Provision is made for federal action to enforce pollution abatement, but only with the consent of the state or interstate agency concerned. It is not expected that pollution control will be tightened in 1955, though such tightening is predicted for the relatively near future.

PRESENT LEGISLATIVE TARGETS: SLUDGE AND SLURRY

Existing laws governing control of stream pollution from coal mines are directed primarily at curbing the discharge of settleable solids from coal washery operations. Typical is the regulation of the Pennsylvania Sanitary Water Board which states, in part: "All waters containing silt or coal mine solids discharged, pumped, or flowing from coal mines, coal handling, preparing or washing plants, or from other colliery operations, shall before discharge to the waters of the Commonwealth, be so treated as to remove substantially all of their settleable solids."

Worthy of note is the fact that ORSANCO is collaborating with the operators of coal preparation plants and manufacturers of water-clarification equipment to develop better methods for removal of settleable solids from washery waters.

The West Virginia State Water Commission believes that maximum pollution-abatement from washeries is achieved through simultaneous cooperation by plant operators in a single watershed. In 1954, the theory was first tested in the Coal River basin. Progress so far indicates that most, if not all, of the plants in the basin will eventually be operating with adequate treatment facilities. An equally notable campaign to control the discharge of settleable solids has been conducted by the Kentucky Water Pollution Control Board in western Kentucky.

ACID WASTES: TARGET FOR THE FUTURE

Regulatory authorities are now focusing increasing attention on acid drainage from coal mines. It is one of the most serious forms of stream pollution. When discharged into streams in sufficient quantities, sulphuric acid kills fish and aquatic plant life and spoils recreation areas. By destroying the "friendly bacteria" that break down sewage, sulphuric acid deprives streams of their natural powers of purification. Result: Streams become virtually too contaminated for use as sources of municipal and industrial water supply.

Extensive other damage is also in the picture. Acid stream waters corrode the metal parts of bridges, bolts and navigation aids such as locks and dams. They corrode the intake pipes, pumps and street mains of water works as well as the piping and fixtures of household plumbing. Unless pretreated with alkali for neutralization, they attack the cooling systems of industrial plants. The possibilities for such damage become considerable when it is realized that (1) the annual acid discharge from the bituminous coal mines of western Pennsylvania is equivalent to 1,000,000 tons of sulphuric acid, and (2) over 800 mines open or reopen yearly in Pennsylvania's coal industry alone.

A beginning has already been made in the extremely difficult job of controlling acid mine drainage discharged into streams.

Indiana has made remarkable progress in reducing acid drainage from exhausted strip mines. The state stream pollution control board and the Indiana Coal Producers' Association developed a program whereby dams are built across the hollows of worked-out strip mines. Lakes are formed which not only neutralize the retained acid waters, but also provide new op-

Stream-Pollution Roundup

LEGISLATIVE TARGETS: SLUDGE AND SLURRY

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ACID WASTES: TARGET FOR THE FUTURE

Regulatory authorities are now focusing increasing attention on acid drainage from coal mines because it is one of the most serious forms of stream pollution.

WHY ACID IS TOUGH

The nature, source and characteristics of acid mine drainage point up the difficult problems still to be solved in developing a practical method for its treatment.

WHAT TO DO ABOUT ACID WASTES

In spite of the varied and sometimes formidable problems involved in final solution to the acid-pollution enigma, mine operators can minimize acid mine water through practicing, as much as possible, certain preventive measures. These boil down to four main lines of action: keep water out, keep drainage moving, segregate sulphuritic materials, and neutralize acids in preparation plant effluent and in "casual" standing pools.

THE ROLE OF RESEARCH

Science has already provided answers to many so-called "insurmountable" stream pollution and other industrial problems. With adequate research and full cooperation from the coal industry and regulatory bodies, it is reasonable to expect that the acid mine water problem will also be solved.

WHAT TO DO ABOUT SLUDGE, SLURRY

For the disposal of settleable solids, operators of coal preparation plants have a choice of three principal methods: sludge ponds alone; thickening with or without flocculation and final cleanup in ponds; and thickening and filtration with or without flocculation. The choice of any one will depend on the amount of sludge and slurry (or slime) to be handled, water supply, plant area and comparative costs.

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portunities for recreational pursuits.

A regulation of the Pennsylvania Sanitary Water Board has prohibited the discharge of acid mine drainage to the clean waters of the commonwealth since May 8, 1945. Also notable is the act approved June 30, 1947, by which the Pennsylvania Department of Mines has the legal authority to enforce the sealing of anthracite and bituminous mines, abandoned before and after that date, when there is drainage into state waters. The Pennsylvania Sanitary Water Board is not yet empowered to restrict the drainage of acid wastes into streams that are already heavily polluted. Here's why: No practical method exists for the control of these wastes. However, increasing knowledge and recognition of the problem of acid mine drainage could be the forerunner to its solution and to restrictive legislation.

WHY ACID IS TOUGH

The nature, source and characteristics of acid mine drainage point up the difficult problems still to be solved in developing a practical method for its treatment. Coal and adjacent strata lying buried beneath the earth have sulphur in various forms associated with them. In the process of mining, the sulphuritic materials are uncovered and exposed to air and moisture. Then, with the possible aid of bacteria, the sulphuritic materials oxidize. Acid-making substances are produced. As these substances are drained out of the mine, they form sulphuric acid in the water and deposit oxides of iron, frequently called "yellow boy," on the bottom of the stream.

Acid, once formed, can come not only from active mines but also from ones that have been abandoned for as long as 50 yr. Other sources include overflow from settling tanks, ponds and flooded strip-mine pits; seepage from old gob piles; and drainage from roads built of mine and preparation-plant refuse. Acid mine water can be discharged by mines that have produced, or are producing, zinc, copper, lead, pyrites, as well as anthracite and bituminous coal. But it is most extensively encountered in the nation's leading bituminous coal-producing states, which include West Virginia, Pennsylvania, Kentucky, Illinois, Ohio, Virginia, Indiana and Alabama.

The nature and sources of acid mine drainage can be fairly well defined. But other characteristics of the problem are more complex and varied. These are some of the difficulties involved:

1. Adjacent mines working the same seam may produce varying quantities of acid water; or one may form acid, the other none.

2. The rate of discharge of acid mine water varies from hour to hour and from day to day. Whatever the ebb and flow of discharge is, however, the acidity of the effluent remains practically constant.

3. There is no relationship between the sulphur content of salable coal and acid formation. Instead, acid formation results from compounds found mostly in roof strata, boney and partings.

4. Impounded acid mine water overflows following heavy rains.

5. It is difficult to fix responsibility for sealing abandoned mines and sections.

6. Standards vary as to acceptable acidity or alkalinity of stream waters.

7. There are no fixed standards for preparation plant performance.

8. Removal of pollution-causing wastes from plant effluent is costly.

9. No two mines, or types of mines, present exactly the same problem.

WHAT TO DO ABOUT ACID WASTES

In spite of the varied and sometimes formidable problems involved in final solution to the acid-pollution enigma, mine operators can minimize acid wastes through practicing, as much as possible, certain preventive measures. These boil down to four main lines of action: keep water out, keep drainage moving, segregate sulphuritic materials, and neutralize acids in preparation plant effluent and in "casual" standing pools. More specifically, here are some things that can be done:

In Strip Pits

1. Cut a drainage ditch on top of the highwall to keep surface water out of the pit (required by Pennsylvania

law), thus enabling outside flow.

2. Keep streams from flowing through the pit.

3. Collect water seeping into the pit from underground springs or old deep mine workings, and pump or pipe it out of the pit.

4. Grade off spoil banks (a) to prevent drainage where the cover material (e.g., shale) will not hold water, or (b) to form pools where the cover material, especially if alkaline in nature, will hold water, thus preventing drainage and permitting conservation of water.

5. Keep water moving out of the pit. Prompt and continuous removal of acid mine water is far preferable to intermittent discharge.

6. Keep pit floor clean of sulphuritic materials.

7. Keep sulphuritic wastes segregated (rider coal, rooster coal, boney, carbonaceous shale, partings, etc.), placing them to one side at the base of the spoil and covering them with clay or clean soil.

8. Backfill the last cut, level off the spoil banks for drainage and then plant spoil banks.

9. Do not strip overburden faster than coal can be mined.

In Auger Mines

1. Pack auger holes with incombustible materials to a minimum depth equal to diameter of the hole (required by Pennsylvania law).

In Deep Mines

1. As far as practical and economical, keep mine water out of the mines by sealing cracks, crevices and other openings, especially if the mine is under shallow cover.

2. Seal openings between deep and strip mines.

3. Keep drainage active and constant (i.e., an even volume of flow), even at the cost of providing a surge pond; thus reducing the concentrations resulting from intermittent discharge.

4. Seal air out of abandoned mines, if possible.

5. Flood abandoned mines, if they can be flooded separately.

In Preparation Plants

1. Neutralize acid mine water, when necessary, through the introduction of a lime feeder into water circuits.

In "Casual" Standing Pools

1. Feed in slurry containing quantities of hydrated lime appropriate for the concentration of acid, the degree of neutralization needed and the quantity of water to be treated. The pool should be left standing long enough for iron to settle out and should be tested regularly against acidity or causticity of the effluent.

RESEARCH HOLDS KEY TO ACID WASTES

Science has already provided answers to many so-called "insurmountable" stream pollution and other industrial problems. With adequate research and full cooperation from the coal industry and regulatory bodies, it is reasonable to expect that the acid mine water problem will also be solved. The solution probably will not be neutralization, since "neutralization of acid mine water at the mine does not appear feasible," according to Mellon Institute reports, which explain that all the limestone quarried in Pennsylvania would not be enough to neutralize western Pennsylvania's 1,000,000-ton annual discharge of sulphuric acid in acid mine water. Besides, wide-spread neutralization would produce hard water.

Future research on the acid mine water problem will most likely be directed toward preventing acid formation. Mining techniques must be developed that will make possible the separation and disposal of iron disulphide material, the control of water flow into mines and the exact location of major deposits of sulphuritic materials. A better means of sulphuritic gob disposal is needed. Another important area of research would be to develop a practical method for treating iron disulphide to prevent its oxidation. Bituminous Coal Research and ORSANCO's Bituminous Coal Advisory Committee are closely watching existing research programs on the control of coal wastes and actively promoting those that give promise of contributing practical solutions.

WHAT TO DO ABOUT SLUDGE, SLURRY

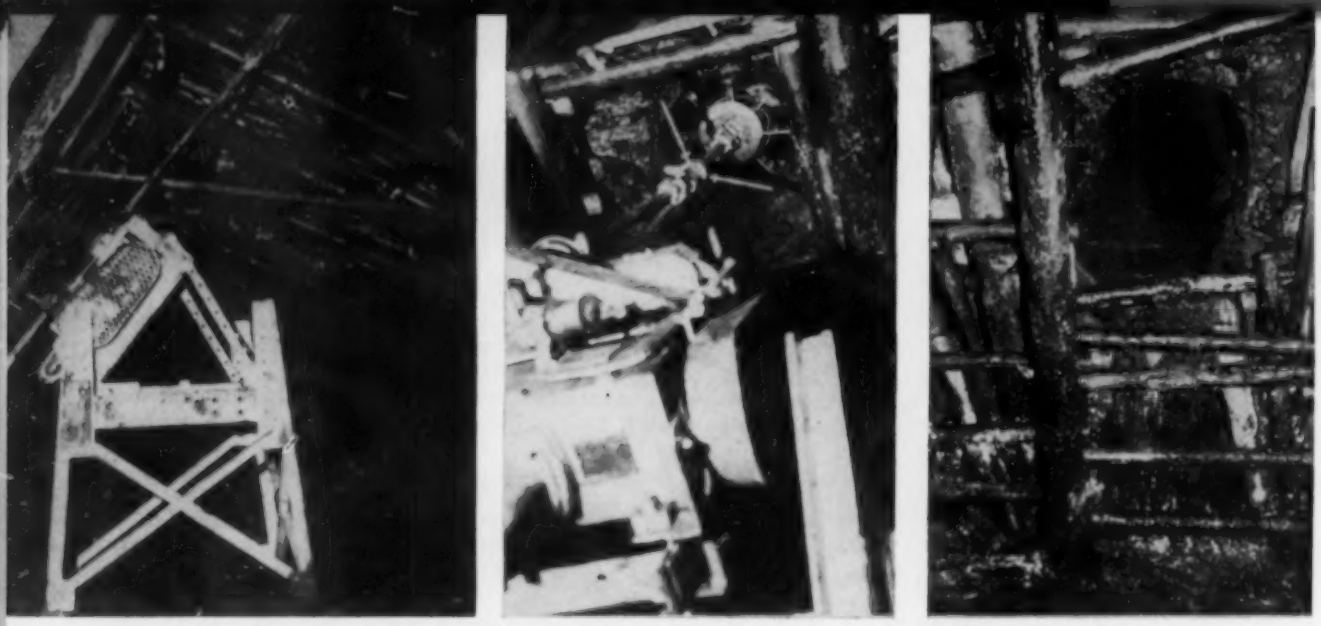
For the disposal of settleable solids, operators of coal preparation plants have a choice of three principal methods: sludge ponds alone; thickening with or without flocculation and final cleanup in ponds; and thickening and filtration with or without flocculation. The choice of any one will depend largely on the amount of sludge and slurry (or slime) to be handled, water supply, plant area and comparative costs.

Using the sludge pond only, a plant bleed stream is discharged to a relatively large land area and impounded within earthen dikes so that the slimes will settle out. The clarified water then overflows to a stream or is returned to the plant. This is the most commonly practiced method, although it is said to be less preferable than other techniques where frequent pond cleaning is necessary, land is expensive or water is in short supply.

In thickening, flocculation and lagooning, a bleed stream from the plant circulation water is withdrawn in sufficient volume to maintain the desired circulating water solids concentration. The stream then passes to a drag tank with a bottom overflow or other type of thickener. A flocculating reagent is added before entrance to the thickener to provide a rapid settling floc. The clarified water from the thickener is recirculated to the plant and the thickened sludge is pumped to a sludge pond. Equipment costs for this method are relatively high, maintenance costs may be greater than with the sludge ponds only, and two disposal methods and areas are needed—one for coarser refuse and one for slimes. Advantages claimed for the method include closer control of circulating water solids at any desired level, and increased efficiency in mechanical water separation. Flocculation may be omitted and the discharge treated by thickening only prior to lagooning.

Thickening, flocculation and filtration is similar to the above method until the thickened sludge is withdrawn from the thickener. At this point, the sludge is pumped to a disc filter where the solids are dewatered and discharged to clean coal or refuse. Filtrate is practically free of solids (generally 100 ppm or less) and can be returned to the circulating water or the thickener feed, whichever is more convenient. Added advantages of following thickening or flocculation and thickening with filtration instead of lagooning are said to include elimination of the sludge pond and its maintenance costs, and maximum reduction of pumping costs and make-up water.

Besides controlling stream pollution from sludge and slurry, solids removal at washeries has this added advantage: it permits recovery of salable coal which, in some instances, has become a profitable by-product operation.



MINE-DESIGNED BORER IN ACTION—Mounted on adjustable stand (left) to drill on a 60-deg pitch; and from rear of the drill (center), with the 36-in cutting head in hole. The completed hole (right) is between timber set on 5-ft centers.

The Martin Borer

. . . A new lightweight, easily movable unit for drilling large-diameter long holes in 30- to 90-deg seams.

By MARTIN ASCHACHER, Mine Manager,
and LOUIS DUPRET, Chief Engineer
West Canadian Collieries, Ltd., Blairmore, Alta., Canada

"THE MARTIN BORER" is a lightweight, compact longhole drilling unit developed by West Canadian Collieries, Ltd., that has proven itself by more than a year of actual operation underground. In its present stage of development, the unit is used for boring ventilation holes and connecting raises and drills holes 20 and 36 in in diameter up to 70 to 100 ft deep, on pitches of 45 to 90 deg. Enlargement of hole size to 5 to 6 ft is anticipated.

In the coal seams of Western Canada, where the pitch varies from 30 to 90 deg, there has been a long-felt need for a machine that would take the labor and expense out of driving connecting raises between levels. Driving raises is a time-consuming chore and always presents a danger to the miners.

Several boring-type machines already have been developed for drilling large-diameter holes in pitching seams, but we found all of them too cumbersome for our purpose, since the machine we required had to be moved easily from one place to another through narrow passages and often had to be erected in cramped quarters. The boring machine we set out to develop had to meet the following specifications:

1. Comparatively small and light in weight, yet capable of drilling 2- or 3-ft-diameter holes 75 to 100 ft deep on any pitch over 30 deg.

2. Drill rods of fairly short length to facilitate erection and extension in tight places; and sturdy couplings easy to fasten or break since the short length of the rods would necessitate a large number of couplings.

3. Horsepower at a minimum to reduce the size and weight of the drive.

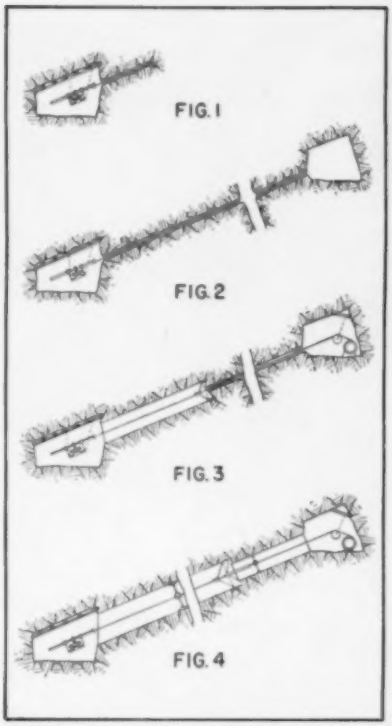
4. Provision for close control of the hole direction so as to originate from a given point on one level and meet a predetermined point on another level.

The main reason for the heavy weight of the existing machines, we concluded, was the necessity of pushing the cutting head, which required a driving mechanism strong enough to transmit a rotation movement combined with resistance to flexion and compression. Furthermore, experience has shown that by pushing large-diameter cutting heads up the pitch it was practically impossible to control the direction of the hole. We decided to try a new principle (patent applied for) with which the cutting head would be "pulled" instead of "pushed," so that the drive and rods would have no other stress than transmitting a rotation movement.

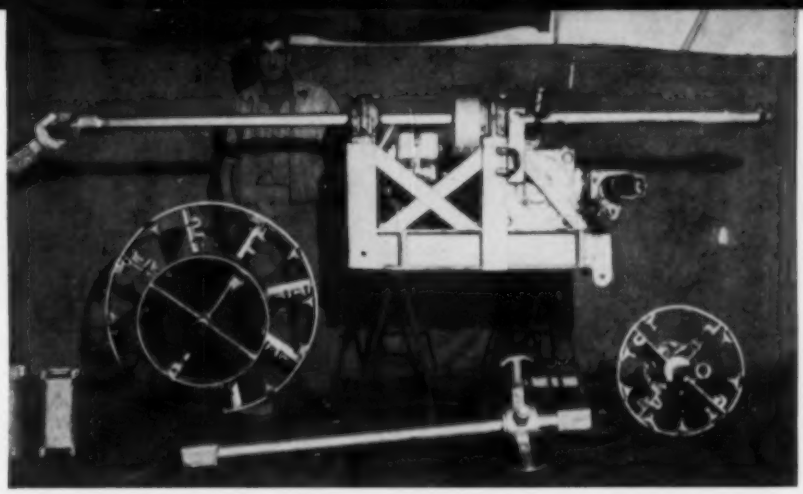
To pull the cutting head, a 2-in pilot hole first is drilled between the two levels to be connected (Figs. 1 and 2). The small-diameter hole is drilled with any conventional equipment and follows very closely any predetermined direction. A cable then is lowered down the pilot hole and fastened to the cutting head (Fig. 3). The upper end of the cable is attached to a small hoist for pulling.

Our first unit consisted of a 20-in cutting head and a 10-hp drive. The results were spectacular, the hole advancing at a rate of 18 to 24 in per min in hard coal. Through trial and error, we found the proper size for the rods, the proper type of couplings, cutting heads, etc., and fairly soon the holes (used for ventilation) became as common in our mines as in Swiss cheese.

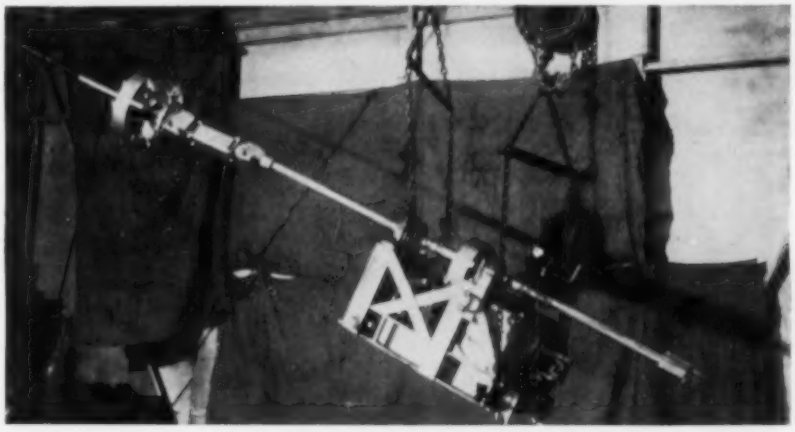
Next, we figured that if it was easy



BORER OPERATION—Easily directed 2-in pilot hole is first drilled between two levels with conventional equipment (Figs. 1 and 2). Hoist cable through pilot hole "pulls" borer's 20-in cutting head at rate of 18 to 24 in per min (Fig. 3). For 36-in hole, process is repeated with larger cutting head using the 20-in hole as guide (Fig. 4).



DRIVE UNIT, cutting heads, rods and other components are lightweight and designed for handling in narrow passageways and erection in cramped quarters.



SUSPENSION FROM ROOF by four chains, as shown by this shop view, is an alternative method of installing borer. Props are used to brace unit.

to bore a 20-in-diameter hole using a 2-in pilot hole, we could just as well bore a 36-in hole using the 20-in hole as a guide for a larger cutting head (Fig. 4). We were delighted to find that the same drive, rods and couplings could handle a 36-in hole as easily as a 20-in hole. This is where we are today in our development. The 36-in boring machine is for us a proven machine used systematically in our operations.

There is no reason why a 5- or 6-ft hole could not be driven by using the 36-in hole as a guide, but that probably would require a 20-hp drive, larger rods and couplings. At the first opportunity, we shall continue our development in that direction.

The 10-hp drive weighs only 1,700 lb and can be either suspended from the roof by four chains, in which case it is braced by props, or mounted on a mobile adjustable platform, as shown in the accompanying photos. The rods are made in 5-ft lengths from standard seismographic drill rods (2⅜ in in diameter). Each rod complete with the coupling end and centering yoke weighs 140 lb. The 20-in cutting head weighs 200 lb and the 36-in cutting head 360 lb, total working weight.

The advantages of a machine of this type can be readily appreciated by a mining man. The initial 20-in hole can be used either as a ventilation hole as such or as a guide for larger-diameter holes. In driving entries and counter entries usually 30 ft apart, a 20-in communication hole is driven in less than 2 hr and permits bringing ventilation close to the working faces. Then either a few or all the 20-in ventilation holes are enlarged to 36-in. as desired. If larger holes are wanted, the 36-in chimney acts as a center cut and collecting chute for blasting a raise of any predetermined section. As pointed out previously, it is expected that ultimately a 5- or 6-ft cutting head using the 36-in hole as a guide will be developed, thus doing away with blasting entirely.

In driving raises between levels, usually 70 to 100 ft apart, the same principle applies and provides the same advantages. In less than two shifts, two operators set up the machine, drill the 2-in pilot hole, then the 20-in guide hole and finally the 36-in hole, on any pitch from 45 up to 90 deg.

Because of the elimination of blasting, the strata are not disturbed in driving the circular holes and all our 20- and 36-in holes have stood perfectly well without any timbering whatsoever—some of them already more than 18 mo old. The smooth 36-in circular section offers less resistance to ventilation than a 5-ft-square timbered raise.

More than a year of regular performance without any breakdown has proven the reliability of our machine. During the last few years the increased use of continuous miners has brought new life to the coal industry and resulted in substantial profits for many operators. The equipment now available, mostly developed for flat-seam mining, is applicable for driving entries and crosspitches in pitching seams. Our machine constitutes a dependable link for the complete mechanization of pitching seams, thus putting such operations on a par with the most modern systems.

West Canadian Collieries has been organized to handle the manufacture and sale of the machine, which we call the "Martin Borer" from the name of its inventor.

MORE ACTUAL WORKING TIME PER SHIFT was a major goal in equipping Hanna's big tractor-trailer coal haulers with automatic centralized lubricating systems, which reduce lubricant consumption and cut down on parts replacement.

Automatic Truck Lubrication

How centralized systems are applied to 50- to 60-ton tractor-trailer coal haulers, and how they save in lubricants, in lubricating delays and in parts by accurate, automatic lubrication in accordance with truck use.

By WAYNE S. FUHR
Lubrication Engineer, Hanna Coal Co., Adena, Ohio
Div. Pittsburgh Consolidation Coal Co.

CONCENTRATED STRIPPING POWER results when two of Hanna's record-breaking shovels meet. Both benefit from centralized automatic lubricating systems, as will the company's 60-yd "super shovel" now under construction.

SEVENTEEN 50- to 60-ton tractor-semi-trailer coal haulers in operation at the Georgetown No. 12 and Bradford No. 16 mines of the Hanna Coal Co. have been equipped with automatic lubricating systems. The first went into operation in December, 1952. To date, several of the systems have operated 100,000 mi or more with a 43% saving in lubricants and a bare minimum of lubricating delays and truck and trailer parts replacement.

Each lubricating system is set up to lubricate 64 bearings and wearing points on each truck every hour while the truck is operating—and only when it is operating. Refilling of the sealed lubricant container as necessary is the only other attention required.

DEVELOPING THE SYSTEM

The work leading to the installation of the automatic systems on the trucks got under way many months before their delivery. It was recognized at the beginning that a flexible and economical haulage operation required the control of several factors. Some of those considered were:

1. Availability of each unit for around-the-clock haulage every day to the central preparation plant serving the two operations.
2. Lower maintenance costs.
3. Lower direct labor costs.
4. Longer equipment life.
5. Maximum return on investment.
6. Safe operation.

It was realized at the time that one consequence of a delay of 1 hr to permit hand lubrication of a truck in the shop would cut average coal delivery to the central plant 100 to 120 tons. Thus, if one truck lost 1 hr out of each 7¼-hr shift because of lubrication, the daily loss of haulage capacity would be 300 to 360 tons and the weekly loss (15 shifts) would be 1,500 to 1,800 tons.

To eliminate or reduce these and other losses to the minimum, it was decided to develop a practical automatic lubricating system suitable for heavy-duty truck service, including ability to withstand severe shock and properly timed for good lubrication under all the variations in weather, temperature and road conditions encountered in strip-mine haulage. The program was assigned to the writer, and after several months of design and development the first entirely automatic system was installed on a Georgetown No. 12 tractor-semi-trailer unit in December, 1952.

64 POINTS SERVED

Each automatic system, as previously noted, serves 64 wear points on each haulage unit. General specifications for these units are:

V-12 engine	400 hp
Speed	40 mph
Transmission	10-speed, manual shift
Drive	Single-axle
Tires, axle and trailer	18x25
Semi-trailer	Drop-bottom
Trailer capacity	61 cu yd
Truck weight, empty	66,400 lb
Pay load	50-60 tons
Appr. loaded weight	166,400 lb
Drive-axle weight, loaded	71,000 lb
Length	50 ft 11½ in
Width	12 ft
Height	11 ft

Bearings and parts directly con-

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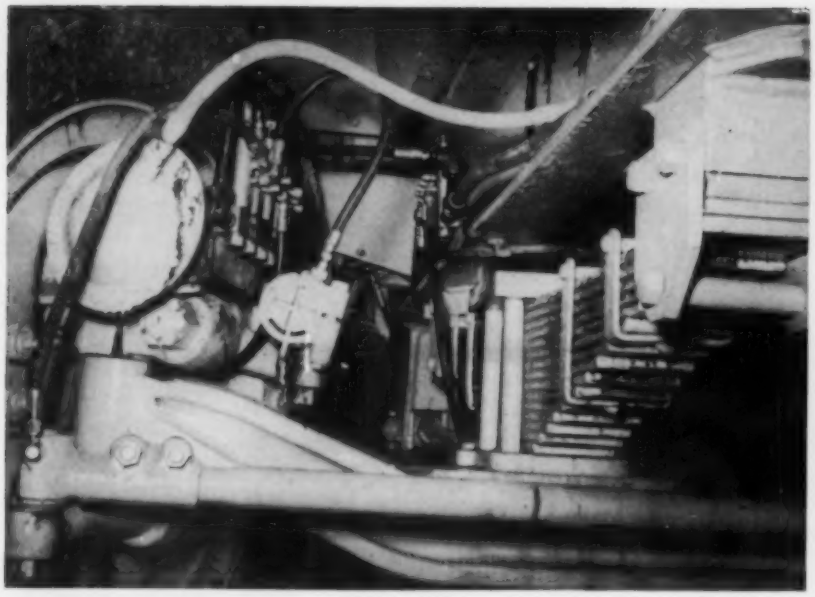
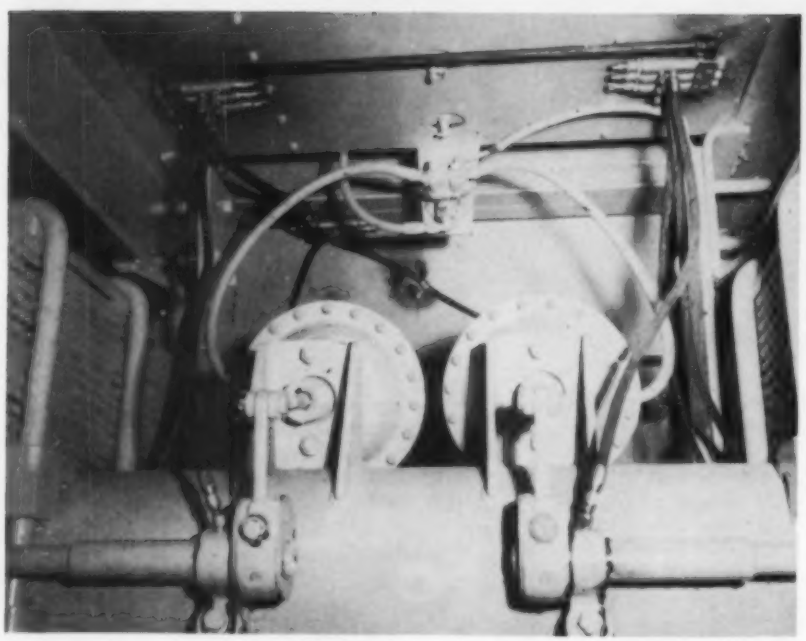




Automatically Serving 34 Bearings

UPPER LEFT—left-side rear view of front axle, tie rod, radius rod and steering drag link showing equipment for lubricating 14 bearings: top and bottom spindle, steering drag link, spindle tie rod and radius-rod bushings and pins; **UPPER RIGHT**—rear of transmission, 12 bearings: brake shaft and linkage, hand brake shoe pins and bushing; **LOWER LEFT**—rear trailer axle looking forward, eight bearings: brake shaft, and radius-rod bushings and pins. Dark-colored hoses are service lines to lubricating fittings.

nected to the automatic system on each truck are:

1. All front-axle and steering-assembly bearings.

2. Miscellaneous lever bearings on tractor.

3. Tractor and trailer swivel-hitch bearings.

4. All axle radius-rod bearings, tractor and trailer.

5. Air-brake shaft bearings, tractor and trailer.

6. All drive-shaft brake-shoe pins and linkage parts.

7. Trailer drop-door cable-sheave bearings.

8. Trailer air-operated dumping mechanism—all bearings, plus air-cylinder piston rod and packing gland; also latch and trip parts.

SYSTEM ELEMENTS

Major equipment involved in the automatic truck-lubricating system is as follows:

1. A modified air-actuated piston-type lube pump, 70:1 ratio; output per stroke, 0.0744 cu in, or approximately 0.036 oz, with lubricant delivery from pump a function of air pressures. With a supply-line pressure of 102 psi, the pumping unit consumes 6 cfm.

2. Sealed lubricant supply container with provisions for refilling without removing lid or parts which may expose lubricant supply to contamination. A 3½-in-square window has been incorporated in the top of container for quick visual inspection of lubricant supply level at all times. The lubricant container is specially designed for big-truck application and operation. Capacity of the lubricant supply container is 14 qt.

3. Automatic master control—the brain center of lube system. It is sealed and mounted in the truck cab.

(*Continued on p 64*)

Control: Basic in Good Lubrication

CONTRARY TO AN ALL TOO WIDELY HELD BELIEF, modern lubrication depends on more than merely the lubricant involved. Lubricants of the finest quality can be complete failures in service if they are not properly applied. The lubricant manufacturer is often unjustly condemned for mechanical failures, when the real cause, in many instances, is the method of application or the way the operator handles the machine.

It is a time-worn axiom that perfect lubrication depends upon evolving a method that will assure the application of the right lubricant, in the right quantity, at the right time. If we accept this as the basic formula in the practice of lubrication, two things at once become apparent:

1. The lubricant, itself, is but one element in the formula.

2. A method or dependable system of application must be devised to provide the other essential elements of "control" over quantity and time.

Obviously, the human element, as represented by an oiler with common oil can or hand-operated grease gun, cannot be relied upon in achieving the right quantity of lubricant at the right time, even when the best of equipment is employed. Consequently, merely applying the right lubricant will not provide lubrication. The element of controlled lubricant application, to insure the replenishment of the right amount of lubricant at the right time, and thus maintain a constant lubricant film, must be accepted as an inherent part of the lubrication function.

Prime Industry Need

Lubrication is the chief factor in efficient machine operation. There is nothing more important in the industrial field than lubrication, for without it machines could not run. Up to less than a century ago, machine lubricants consisted entirely of animal and vegetable fats and oils. Petroleum, which at the present time represents the bulk of all lubricants, was first used in 1845. Today it is one of the world's most important and largest industries.

Lubrication has been greatly improved in the past decade as a result of highly scientific methods and practices. Better steels and other metals are now being produced; also, more efficient machining and finishing of metals is possible today, all of which permit operating machine parts at greater loads and speeds. To cope properly with these new conditions it was, of course, necessary for lubrication to keep pace. The development of specialized lubricants followed.

Lubrication is now a science. In days gone by, machine manufacturers and refiners and compounders of lubricants had little regard for each other's problems. Today finds the situation entirely changed in that equipment builders and lubricant manufacturers are cooperating to the fullest extent. Design engineers now realize more than ever before the important part correct lubrication plays in the production and efficient operation of more perfect machines. They know beyond the shadow of a doubt that proper lubrication is vital in determining the life expectancy of bearings, gears, chains, cylinders and other moving parts that go into a machine.

Lubrication of old machinery also is an industry problem today—but a problem that can be solved by the proper selection and application of lubricants at predetermined intervals. Many old machines that might otherwise be discarded have been found to operate with new efficiency by adopting the above procedure.

Control the Essence

The essence of lubrication economics, as related to application, is summed up in the word "control." The meaning and significance of "controlled application" can be most strikingly illustrated by contrasting the degree of "control" provided by methods using oil cans and hand-operated grease guns with that provided by modern centralized systems for mass lubrication.

Since the beginning of the century, and up to the present time, conventional oil cans and, a little later, hand-operated grease guns have been the primary lubricant-application tools of industry, despite the fact that the average industrial plant has grown to immense size, some with complete operations on one floor level, others with elevations equal to a 10-story modern office building. Equipment and machinery are primarily designed for continuous operation and constant mass production. Many types of bearings are found on these modern machines and the number is far greater. Most present-day machines are precision-built to operate at greatly increased speeds, and are designed to carry heavier loads continuously.

To meet these tremendously advanced machine requirements, petroleum companies have spent millions of dollars in research developing lubricants. Yet, according to a survey by the editors of a popular national magazine, 90% of U. S. industry is still relying on the common oil can and grease gun in the hands of a human oiler to protect and maintain its investment of billions of dollars in production machinery. Finest lubricants in the world, finest machines ever developed, and the oil can and grease gun are depended upon to apply one to the other. Is it any wonder that industry accepts fabulously expensive down time and costly replacement of prematurely worn bearings due to improper lubrication as customary operating routine!

Critical Factor

The inability of the oil can and grease gun to meet today's machine lubrication requirements rests in the fact that there is no element of control. One can only assume that the right lubricant has been selected for every bearing, that every bearing will be located and lubricated, that the proper amount of lubricant will be applied to each bearing, that the lubricant will be applied at the proper time intervals, that the lubricant will flow to the bearing after application, and that, finally, the lubricant will be free of contamination.

Aside from the fact that there is no control, the cost of oil cans and grease guns is threefold: (1) initial cost; (2) cost of carrying them around, and (3) cost of the consequences resulting from the way they are used.

Bearing failures due to improper lubrication growing out of insufficient, excessive or contaminated lubricant result from slow cumulative wear. The process cannot be readily detected by observation, nor controlled by an exacting choice of lubricant or by the most rigid lubrication instructions. It is inherent in the method of application and cannot be controlled as long as the factors governing application and contributing to wear are unknown even to the man who carries the oil can or grease gun, regardless of his level of intelligence or his desire to do a good job.

—WAYNE S. FUHR

Size of the control unit is 14x14x4 in. It consists of a 4-way valve; 10-amp double-action relay; adjustable electrically controlled timer; double fuse block; and a pressure control switch—maximum, 3,000 psi.

4. Lubricant injector valves at each lubricated point. The operation of each injector valve is positive and dependable under the most severe operating conditions, including mud, water, or freezing conditions at below-zero temperatures. Lubricant is discharged from an injector by the action on the piston of the full pressure of the lubricant in the supply line. The return of the injector piston to its normal position readies it for the next lubricant discharge cycle to its particular bearing. An external adjusting nut controls the lubricant discharge in quantities from zero to 0.04 oz. A visible indicating stem moves in with each lubricant discharge and out with each reloading of the injector valve. Each injector is equipped with a ⅛-in fitting for initial filling of feeder lines to each bearing, and also for visibly checking the quantity of lubricant discharged to bearing at any time.

High-pressure hose and pipe in three I. D. sizes are used for feeder and discharge lines. Standard lengths and sizes were adopted as far as possible so that each type could be used on any truck unit. One result is a minimum inventory of sizes and types.

LUBRICANT CONSUMPTION

The homogenized lubricant used in these systems falls in the lime-soap mild-E. P. (extreme-pressure) category. It has a buttery tacky texture and is easily pumped. It is compounded with a high percentage of a 1,200-sec mineral oil stock, and has a good pour point and a worked penetration number of 390 at 77 F. It also is a very stable product and does not separate under extreme working pressures, while providing a very good uncontaminated protective seal around the bearings.

In contrast to the quantities of lubricants dispensed with hand-operated grease guns depending entirely on the human element for results, the automatically controlled and timed lubrication systems cut wastage of lubricants by as much as 43%. Two factors are primarily responsible: (1) positive control at all times over the entire system, and (2) predetermination of the exact quantity needed to maintain a constant lubricating film at all times, which this system makes possible.

DELAY TIME REDUCED

Our records indicate that for 1953 and 1954 the 10 Euclid coal haulers at Georgetown No. 12, the first to be equipped, lost only 6 hr 30 min as a result of delays charged to the automatic lubrication system. Part of this lost time was chargeable to experimental changes and adjustment of system timing cycles. In 1954, out of 34,487 scheduled operating hours, total delays were as follows: tractors, automatic systems, 2 hr 15 min; all other lubrication delays, 4 hr 45 min; semi-trailers, all lubrication delays, 1 hr 30 min. The 1954 costs for these 10 haulage units were:

	Labor	Supplies
Tractors:		
Automatic lube	$323.47	$69.27
Other lube	5,878.31*	1,836.38
Trailers:		
All lube	179.47	45.10

* Includes changing engine oil, greasing universals and all service, including such items as cleaning air filters, etc.

On seven other Euclid coal haulers of the same type located at Bradford No. 16, delays chargeable to the automatic lubricating system totaled 35 min in 8 mo of operation.

NO PARTS REPLACEMENT

As of Jan. 1, 1955, several of these coal haulage units had operated over 100,000 mi, with practically no replacement of those parts of the tractors and trailers mass lubricated by the automatic control system, although some parts were replaced because of defective materials or factory changes in design. The fact that there has been no replacement of parts which were automatically time-lubricated proves beyond a doubt that a constant lubricating film has been maintained at all times under all weather and operating conditions.

SYSTEM COST

To the best of this writer's knowledge, one of Hanna's 17 Euclid coal haulers was the first to be equipped with a proven and successful system of this type in December, 1952, and the 17 installations are still the only ones known to be in continuous operation which are entirely automatic and time controlled to operate only when the truck is running. The system is completely sealed and timed with no possible chance of contamination of lubricants under any haulage conditions, and no one is required to start or stop its operation. Replenishment of lubricant supply in sealed container when needed is the only routine requirement, except for periodic checkups as a part of the general inspections of the complete truck unit set up in the preventive-maintenance program, which should be a must with all mobile-equipment fleets, regardless of size, in any industry.

Cost of the installation of one complete automatic system, including all necessary labor and materials, ready for road service, is 0.0267% of the original coal hauler price.

WHAT AUTOMATICITY MEANS

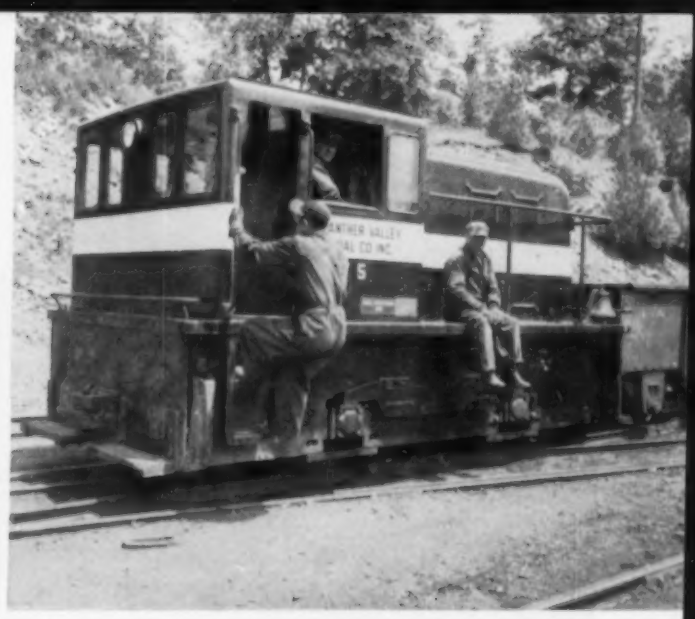
The completion of the truck program marks one more step in the installation of automatic lubricating systems at Hanna properties, which began with the Georgetown central plant and later was extended to Hanna's 5561 stripping shovels, as more fully described in *Coal Age*, January, 1952. The central plant was equipped with a dual system to eliminate delays—and there have been none. It has been added to on an extensive scale, and the lubricating cost is now lower than in the system's first year of operation. In 1954, the labor cost in lubricating the central plant was $0.0024 per ton; supplies, mostly mild E. P. grease, also $0.0024 per ton.

This leads me to propound once more one of my pet questions—and one that usually arouses considerable discussion: "How can industry management and personnel directly responsible for keeping equipment properly maintained and available for production afford *not* to have a planned and practical lubrication program that will contribute to efficient operation and result in a finished product well able to meet keen competition, especially when a buyers' market prevails?"

There is an answer to practically any problem if it is approached with determination and a desire to proceed from facts. Let me say to the readers of this article: "It is later than you think. The time to plan for efficient, economical lubrication is now."

The Hanna Coal Co. has specialized in breaking world's records in stripping, starting with 1,115,833 cu yd of overburden moved in a month in October, 1948; 1,505,143 cu yd in August, 1951; 1,727,606 cu yd in October, 1954; and 2,057,438 cu yd in January, 1955. The company's new 60-cu yd super shovel to come will set new records. It, too, will be equipped with a centralized automatic lubricating system designed and installed by Hanna's lubrication section.

These past yardage records were not the result of accident or magic. Rather they, and the others to come, were the result of training, analysis of problems, work planning and synchronized team operation, with efficient, positive and controlled lubrication playing a vital supporting role.



80-TON DIESEL-ELECTRIC LOCOMOTIVE (left) is one of three now hauling 40 mine cars per trip where older steam-powered units hauled 30 cars. The 25-ton diesel-electric (right) is a versatile, economical unit for less-arduous duty.

Saving with Modern Haulage

Six new diesel-electric locomotives at Panther Valley Coal Co. provide dependable, continuous surface transportation in hauling coal from strip-mine ramps and deep mine to preparation plant.

THE STEAM-SNORTING "IRON PONY" trots into retirement close on the heels of the bigger Iron Horse, and his job has been turned over to diesel-electric locomotives in surface-haulage operations of Panther Valley Coal Co., Lansford, Pa., resulting in increased efficiency and more favorable operating costs.

The six new units, replacing ten steam-powered locomotives, consist of three 80-ton and three 25-ton machines built by General Electric. The 80-ton locomotives are duplicates of the switching units used on large railroads, modified only to the extent of satisfying the 42-in track gage at the colliery.

The big benefits, according to coal-company officials, derive from the fact that the diesel-electrics require less maintenance and that they are able to work on demand at any time during the working shift. Steamers on the other hand required constant attention on the non-operating hours and over short periods when the colliery is idle. It sometimes happened that a delay at the beginning of a hard pull was necessary to permit a full head of steam to be raised.

Panther Valley Coal Co. operates the properties formerly known as the Nesquehoning and Lansford districts of the Lehigh Navigation Coal Co. All coal is cleaned at Lansford breaker, necessitating a haul of 3 mi from Nesquehoning workings to the cleaning plant. The profile of this haulageway includes a 9,500-ft run on a 3¼ to 3½% grade against the loads from Nesquehoning to a 5-track turnout on a flat hilltop, then a 5,400-ft run on similar grades in favor of the loads down to the Lansford plant.

Two of the 80-ton units operate on the 9,500-ft run against the adverse grades, hauling 40 mine cars per trip to the turnout, with each car weighing about 8 tons gross. The third 80-ton locomotive hauls the cars from the turnout down to the cleaning plant. Sliders under the wheels of the first four cars insure positive control of the trip on the downgrade, but the air-braking systems of the locomotives have sufficient capacity for the job.

Two of the smaller locomotives haul strip-mined coal from two loading ramps to the preparation plant. The other moves mining supplies and performs other yard functions as needed at the cleaning plant.

In the matter of physical equipment, the 80-ton units each have a pair of Cummins NHBIS-600 diesel engines, with a combined rating of 470 hp, providing power to turn the main generators. The generators supply 300-v power to four traction motors, one on each axle.

Each of the 25-ton units is equipped with a 150-hp Cummins HBI-600 diesel engine driving a generator which powers a single traction motor. The smaller-type locomotive has a fuel capacity of 75 gal, and the larger 400 gal. All are equipped with 33-in wheels.

Auxiliary equipment includes Gardner-Denver compressors to provide compressed air for braking, battery-energized self-starting systems and heating elements in engine-coolant systems to insure fast, easy starts on cold mornings.

The new locomotives have been in service since February, 1955, making any report on maintenance costs premature, company officials say. But all indications are that such costs will be markedly reduced since hostlers, boilermakers and machinists are not required, and unit assemblies may be replaced in short order to head off delays.

Highlighting the gains in utilizing total working time with the new units, Panther Valley officials point out that fuel is taken on only every second or third day and traction sand is loaded every second day. This is a favorable contrast with the older units which made frequent stops every day for boiler water, coal and sand. It's this combination of factors which finally leads to doing the job with fewer units in operation.

DIESEL-POWERED dragline with 165-ft boom and 13-yd bucket moves most of the overburden at DeBardeleben.

Stripping "90 for 2" Pays Off at DeBardeleben

Progressive management combines efficient stripping by dragline and shovel with new-type low-cost blasting medium to obtain smooth, economical mining of 22-in seam under 90-ft cover in Alabama.

By A. E. FLOWERS
Associate Editor, COAL AGE

HOW IS IT POSSIBLE to move up to 90 ft of overburden to mine 22 in of coal at a profit? Most mining men who might be asked that question probably would answer that it couldn't be done. But it is being done by the DeBardeleben Coal Corp. at Sipsey, Ala. There, up to 90 ft of cover is being removed to recover 850 tpd from the 22-in Black Creek seam. A high-quality coal that washes down to 2% ash and 14,800 Btu; nearby diversified markets; efficient stripping methods and effective management are key factors in the success of the operation.

The DeBardeleben management team is headed by H. F. DeBardeleben, chairman of the board, whose office is in Birmingham. Other members of top management having offices in Birmingham are N. H. DeBardeleben, president; B. T. DeBardeleben, vice president; and A. W. Vogtle, vice president, sales. L. O. Stonecypher, general superintendent of strip mines, has headquarters at Sipsey and directs the strip operation from there. J. Elliott, chief engineer, and F. M. Roberson, field superintendent, also headquarter at Sipsey.

The scene of mining is about 25 mi northwest of Birmingham near Sipsey, Walker County, Alabama, where DeBardeleben owns 28,000 acres of coal land. Although the company has been actively engaged in mining since 1912, officials estimate that reserves will last for another 40 yr.

All of DeBardeleben's coal was produced by underground methods until 1947, when the company decided to try strip mining. Even though engineering investigations indicated that the overburden would be thick and tough, and that the stripping ratio would be high in recovering the 22-in seam, management was confident that mining costs would be lower than with deep methods. Results of the early stripping proved management's analysis to be correct. Since then strip-

ping output has been expanded and now 850 tons per day is produced. Deep mining by the company has become secondary to the stripping.

WHAT THE OVERBURDEN IS

Overburden consists mostly of hard shales and sandy shales, with the latter sometimes grading into sandstone. The percentage of sandy shales or sandstone in the overburden varies from 20% up to 50%.

Typical strata in the two active pits are:

Surface	
Soft brown sandy shale ..	13 ft
Blue shale	12 ft
Inferior coal	2 ft
Fireclay	2 ft
Blue shale	16 ft
Mixed sandy shale	7 ft
Blue shale	10 ft
Black Creek Coal	22 in

APPLYING LOW-COST EXPLOSIVE

Because drilling and shooting overburden are a major cost item, special attention is focused on them. Since August, 1954, DeBardeleben has been using Akremite to reduce blasting costs by as much as 50%. At the same time the new-type explosive has produced better fragmentation, thus permitting stripping units to move 25% more material.

Alertness of F. M. Roberson, superintendent, while on vacation in July, 1954, was responsible for the early application of Akremite at DeBardeleben. Here's how it came about.

While visiting C. A. Kelley, who is superintendent for the Colonial Coal Mining Co., Mr. Roberson learned that Colonial was using successfully a new-type explosive. He learned that the new explosive, Akremite, developed by the Maumee Collieries Co. (May *Coal Age*), was doing a fine job at a lower cost than conventional explosives. Such a development could be very helpful in cutting blasting costs at DeBardeleben.

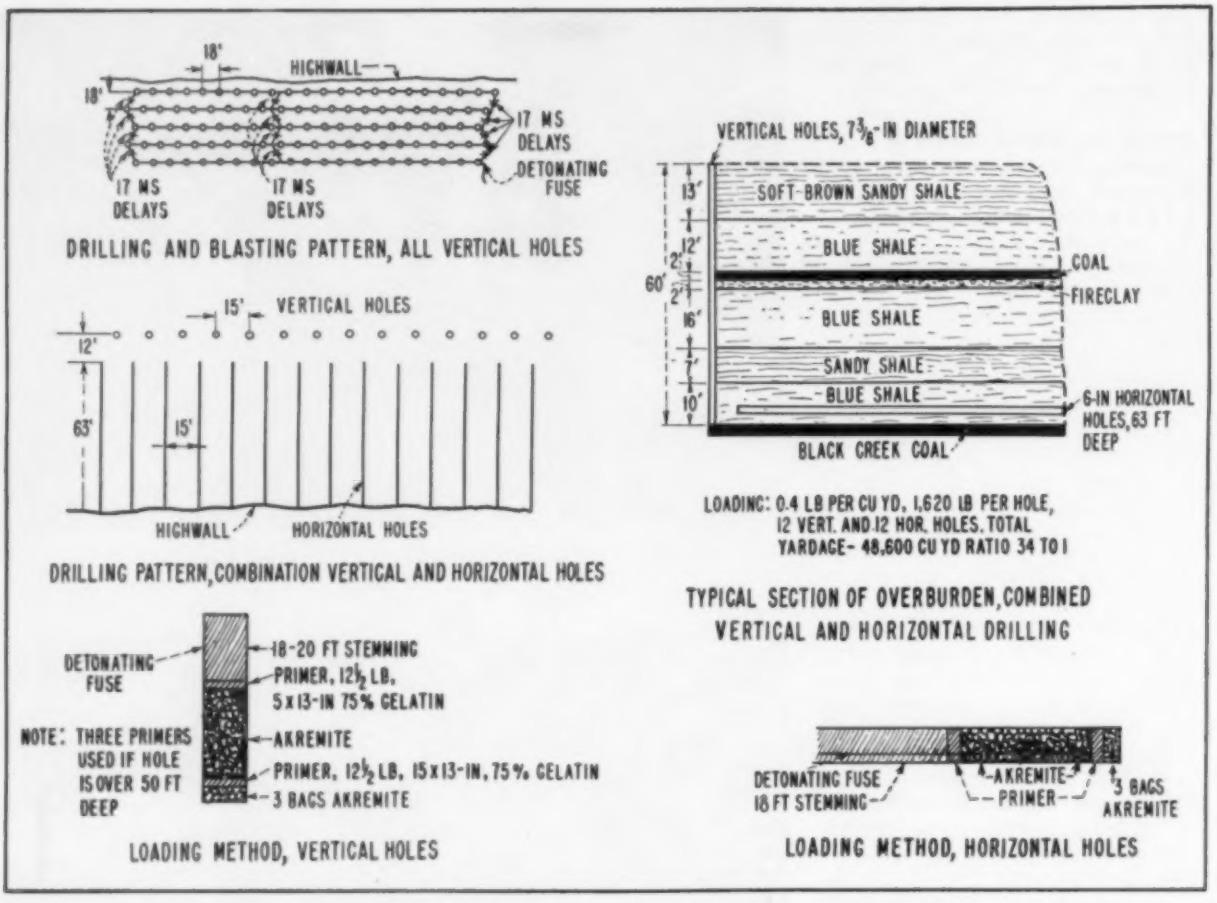
Armed with all the information available at Colonial, he returned to Alabama and described what he had seen to L. O. Stonecypher, DeBardeleben's general superintendent. Stonecypher was so impressed with what he heard that he immediately phoned Kelley in Madisonville, asking permission to visit the mine to learn more about Akremite. The following day, July 12, 1954, he drove to Madisonville to observe the results obtained with the new explosive.

Full of enthusiasm after seeing results in the Colonial pits and talking with Colonial's management, Stonecypher believed that Akremite could be of real help at his mine in Ala-

SECOND STRIPPER is 5½-yd electric shovel working in 45-ft pit while moving up to 50 ft of cover. Both strippers work three shifts.

TYPICAL HIGHWALL broken with new explosive at DeBardeleben includes hard sandy shale and sandstone, which varies from 20% to 50% of overburden.

COAL LOADING into 32-ton dropbottom trucks for the 3½-mi haul is assigned to diesel-powered 2½-yd shovel that alternates between pits.



DRILLING PATTERNS at DeBardeleben include all vertical holes or combination of vertical and horizontal.

bama. Acting quickly after returning from the pit, Mr. Stonecypher called Hugh B. Lee, president of Maumee, at his office in Terre Haute, requesting an appointment to discuss using Akremite at DeBardeleben. Mr. Lee agreed to wait in his office that day and discuss the matter as soon as Mr. Stonecypher arrived in Terre Haute.

Jumping into his car once more, Mr. Stonecypher drove another 160 mi that day to Terre Haute. Within an hour after Messrs Lee and Stonecypher had met they had reached an agreement whereby DeBardeleben would be licensed to manufacture and use Akremite.

About a week later, Robert L. Akre, Maumee's drilling and blasting superintendent, visited the DeBardeleben mine to determine if the new explosive could be used successfully. Examining highwalls in active and inactive pits and watching stripping units in action, Mr. Akre agreed that the new explosive would be suited to the job.

Shortly thereafter, construction of an Akremite mixing plant was begun on the DeBardeleben property. While the plant was taking shape, Mr. Stonecypher and N. H. DeBardeleben, president, went to the Maumee operations to witness several shots of Akremite. Both men were impressed with results of the blasting.

TESTING AKREMITE SAFETY

Soon after reaching an agreement with Maumee to use Akremite at the DeBardeleben mines, company officials decided to learn as much as possible about the new explosive before using it. As a result, DeBardeleben hired the Southern Research Institute, Birmingham, to make a complete study of Akremite. The institute also co-operated in the design of the mixing plant and made recommendations for safety procedures.

In addition to making a literature survey and a summary of the findings, the institute carried out a series of tests on freshly made Akremite; Akremite that had been cycled through the phase transition temperature for ammonium nitrate; and a group of conventional explosives. Included in the tests were: international stability test, pendulum friction test, rifle-bullet impact tests, propagation-through-air tests and the USBM fuse test for fire resistance, all stringent tests.

Results of the tests showed that no explosion, fire or crackling was noted in either the rifle-bullet test, pendulum-friction or the modified propagation-through-air tests performed on the ammonium nitrate raw material which was cycled through the phase transition temperature. The rifle-bullet impact test on dynamite showed four violent explosions out of four trials. Black powder burned violently in the USBM fuse test but neither the Akremite nor the raw nitrate burned before or after temperature cycling.

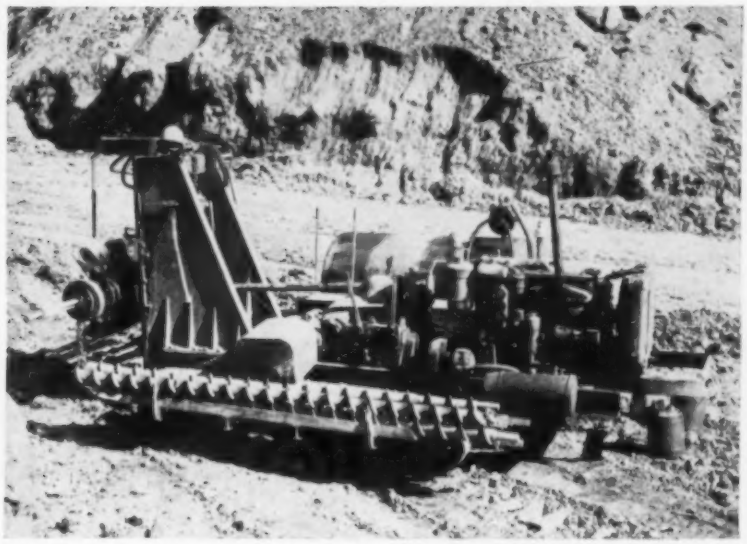
Results of the tests were gratifying and management was reassured that Akremite was a very safe material to handle and use.

BLASTING WITH NEW EXPLOSIVE

DeBardeleben's first shot was put off Aug. 13, 1954. To make possible a comparison between Akremite and conventional explosives, blastholes were drilled on the same pattern and loaded the same as with conventional explosives.

Removal of the broken material with a 450W Bucyrus dragline revealed the following:

VERTICAL DRILL sinks 7⅞-in blastholes on two shifts. Bits cut 5,000 ft of hole.



SIDEWALL AUGER mounted on crawlers bores holes 6½ in in diameter to a depth of 63 ft in the softer overburden.

MIXING PLANT for new-type explosive was designed by DeBardeleben to permit easy handling of ingredients and finished products.

1. Fragmentation was better than with conventional explosives.

2. The stripping unit was able to work more efficiently and therefore move 25% more material per hour.

3. Cost of Akremite was much less than conventional explosives. To date, over 400,000 lb of Akremite has been used to break well over 1,000,000 cu yd of overburden. There have been no failures, even in wet holes.

To meet the varying conditions in thickness and type of overburden, DeBardeleben varies drilling patterns and quantity of Akremite per cu yd of overburden. For example, the quantity of Akremite per cu yd ranges from 0.3 lb in softer material consisting of 20% sandstone and 80% shale to 0.5 lb where 50% of the material is hard sandstone. As material becomes harder, more vertical holes are drilled in conjunction with horizontal holes. Sometimes all holes are drilled vertically.

If all holes are vertical, 60 to 80 are set off in one shot. If horizontal and vertical are combined, 25 of each are detonated together.

Vertical holes are 7⅞ in diameter and usually are drilled 18 ft apart in rows spaced similarly. Holes are drilled in a diamond pattern. When vertical and horizontal holes are combined, verticals normally are put down on 15-ft centers at the back of the cut. Horizontal holes are then centered between the vertical ones and drilled to a depth of 63 ft, bottoming 12 ft ahead of the vertical holes.

Vertical blastholes are drilled on two shifts by an Ingersoll-Rand Quarrymaster rotary unit equipped with Hughes Tri-cone rock bits. Each bit drills an average of 5,000 ft of hole before it is worn out.

Two men operate the drill and help a third man load holes with explosives. Each crew drills 400 to 600 ft of 7⅞-in hole per shift while helping to load blastholes. Rock is penetrated at the rate of 3 to 6 fpm, depending on the hardness.

Horizontal holes are drilled to a depth of 63 ft by a Joy unit powered by Caterpillar D311 diesel engine.

Akremite is not cap sensitive and therefore must be detonated by a high explosive. Each hole is primed with two or more 12½-lb cartridges of 75% gelatin. Primacord is placed in each hole and detonated with 9- and 17-millisecond delays. The shorter delays are used when holes are spaced closely.

A typical vertical hole is loaded as

MODERN preparation plant includes jigs, wet tables and flotation units for cleaning all sizes at DeBardeleben. Plant processes 2,200 tons in single-shift operation.

SUPERVISORS include J. Elliott, chief engineer; F. M. Roberson, field superintendent; and L. O. Stonecypher, general superintendent, stripping

GARAGE provides shelter and service area for coal haulers. Spare truck is kept ready at moment's notice.

MAINTENANCE TRUCK contains small shop and welder for servicing stripping equipment in the field.

follows: three bags of Akremite in the bottom of the hole; next, a 12½-lb 5x13-in primer of 75% gelatin, followed by Akremite to within 20 ft of the top of the hole. The charge is topped with a second primer and the remainder of the hole is filled with stemming. If the hole is more than 50 ft deep, a third primer is used.

Horizontal holes are loaded with three bags of Akremite at the back of the hole; next, a 12½-lb primer, followed by Akremite to within 18 ft of mouth of hole; then a second primer and stemming to fill the hole.

Akremite is mixed in the DeBardeleben plant by three drillers and blasters, usually 2 days per week. They mix about 12,000 lb per 7¼-hr shift. After they have mixed a weekly supply, they drill blast holes for the remainder of the week.

UNCOVERING THE COAL

A 450 Bucyrus-Erie dragline with a 165-ft boom and swinging either a 12½-yd Page or 13-yd Esco bucket handles the bulk of the overburden at DeBardeleben. Powered by an 850-hp Cooper-Bessemer diesel engine, the unit uncovers coal three shifts per day, 5 days per week. Working in a pit 75 ft wide and handling an average of 60 ft of overburden, the dragline moves 13,000 cu yd per day. At times it has worked in areas with as much as 90 ft of cover to expose the 22-in seam.

DeBardeleben's second stripping unit is a P&H 1600 electric shovel with a 5½-yd dipper. In the second pit, the shovel works a 45-ft pit while moving up to 50 ft of cover. This unit also works round the clock, 5 days per week.

LOADING AND HAULING

A P&H 655B shovel, powered by a Caterpillar D1700 diesel engine, loads coal from both pits. The 2½-yd unit is assigned to alternate pits as needed only on the day shift.

A fleet of Dart tractors powered by 185-hp Cummins diesel engines and 32-ton United Iron Works trailers haul coal about 3½ mi to the preparation plant. Three of the units are in operation regularly while the fourth is held in readiness as a spare. The three units haul an average of 850 tons in one shift, each truck making about eight round trips each day.

Solid well-constructed haulage roads contribute greatly to haulage efficiency. Roads are topped with red dog from the company property and a Caterpillar motor grader keeps the surface smooth.

The Coal Commentator

Well Deserved

"National Coal Week" has been proposed by Appalachian Coals, Inc. The suggestion is so good that one wonders why it was not put forth before. As one looks across the world, it becomes quickly apparent that the industrial economies and—more important—the higher standards of living are found in the areas where coal—particularly of the metallurgical type—and iron ore are mined, processed and used economically and in quantity. There is no question of the leadership of the United States in maximum output of the highest-quality coal at the lowest price, and consequently no question of the importance of the coal-mining industry in the development of the highest standard of living in the world. By any method of evaluation, coal is entitled not only to a "week" but also to a stamp, a medal and any other form of recognition granted for a vital job well done.

Curiouser Still

A shortage when none should have occurred, and a hair-raising suggestion for solving the passenger-deficit problem, are numbered among the recent developments in a railroad picture that gets "curiouser and curiouser." The shortage that shouldn't be is in coal cars. Even though production has spurted recently, there should have been enough cars to take care of the increase. The answer seems to be that at least a fair share of the railroads—possibly reflecting in another way their lack of appreciation of the value of coal as a revenue contributor—have failed to replace wornout equipment and, in addition, have failed to keep serviceable cars in repair. As a result, it may be touch and go on car supply for some time.

The hair-raising suggestion was made June 28 by Richard F. Mitchell, chairman of the Interstate Commerce Commission. Acknowledging that this deficit, which he placed at either $400,000,000 or $600,000,000 a year, was boosting freight charges, he proposed that instead of making passenger service pay its way the deficit be saddled on the taxpayers in the form of a "subsidy" for passenger traffic. Comment by your commentor: **"No more subsidies, please. We already are paying for more than we need."**

1 for 50?

Believe it or not, granite is now a possible future replacement for coal—or so says Dr. Willard F. Libby, of the Atomic Energy Commission. He developed this theory in a speech at Marquette University June 21 discussing the possibility of fissioning U-238 and thorium. If it should work out, the total fuel value of granite "is 50 times its weight in coal." Then what? As for granite, says one engineer fairly familiar with atomic materials production: "If you give me my choice, I'll mine and prepare 50 tons of coal any day compared to mining, crushing, fine grinding, concentrating and chemically recovering the U-238 and thorium from a ton of granite. The coal Btu's would be a lot cheaper."

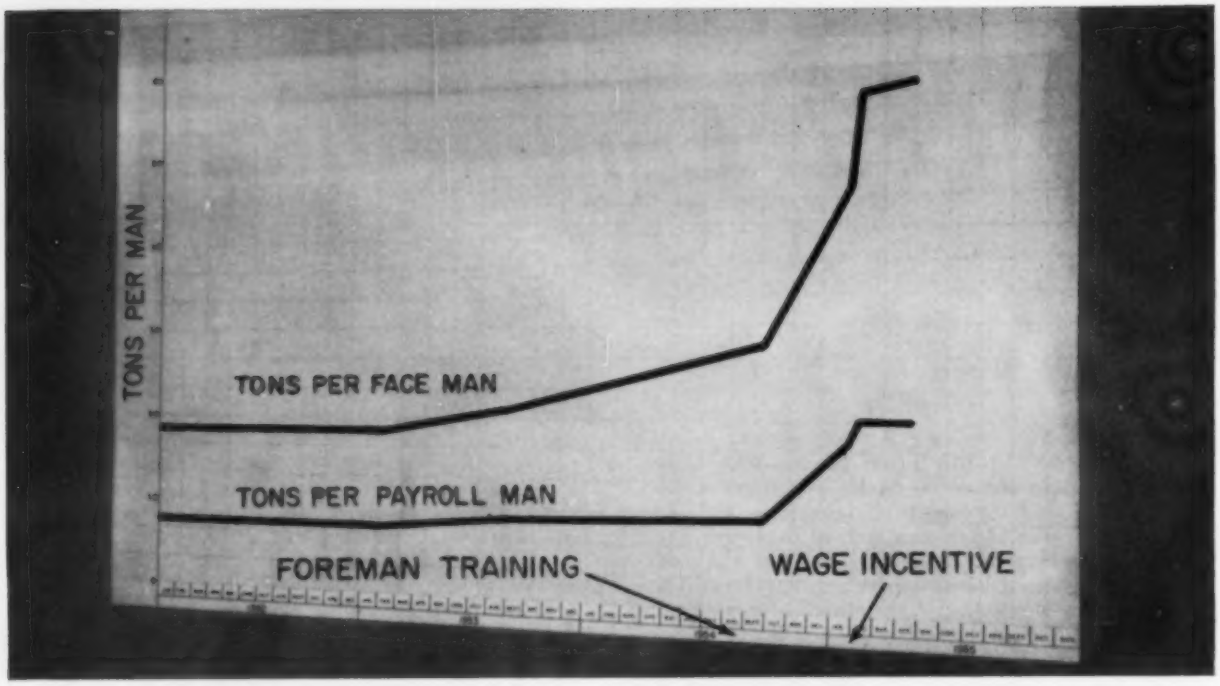
Which conclusion leads us into a further discussion of the role of low cost in opening up new fields for coal, as well as expanding old. The production of fissionable materials is one that already has been noted on several occasions. A new first cousin is the production of taconite pellets for the steel industry. Processing the ore will take around 80 lb of coal per ton in the form of electricity, and pelletizing will use 65 lb per ton of flotation anthracite. Two plants already are planned for 10 million tons a year each, meaning that their requirements alone will total around 3,000,000 tons of new coal business a year. **From air conditioning to titanium smelting, the uses for atomic power still are only talk, and coal still has a solid lead in the fuel race of today and tomorrow.**

Fishermen's Delight

Coal men do many things besides get the stuff out of the mine, put it through the processing plant and get it away to the consumer. Some of them fish. As part of the service rendered by your commentator, the attention of fishermen is called to a new German scaling knife that also can be used for weighing the little ones—up to 4 lb. And for lighting up while you're busy dragging them in, another German manufacturer offers a low-cost one-hand flamethrower. And to keep you comfy, still another German concern will provide you with a blanket made like a poncho for easy wear. All the more reason for not letting the big ones get away.

Bonus Unlockers

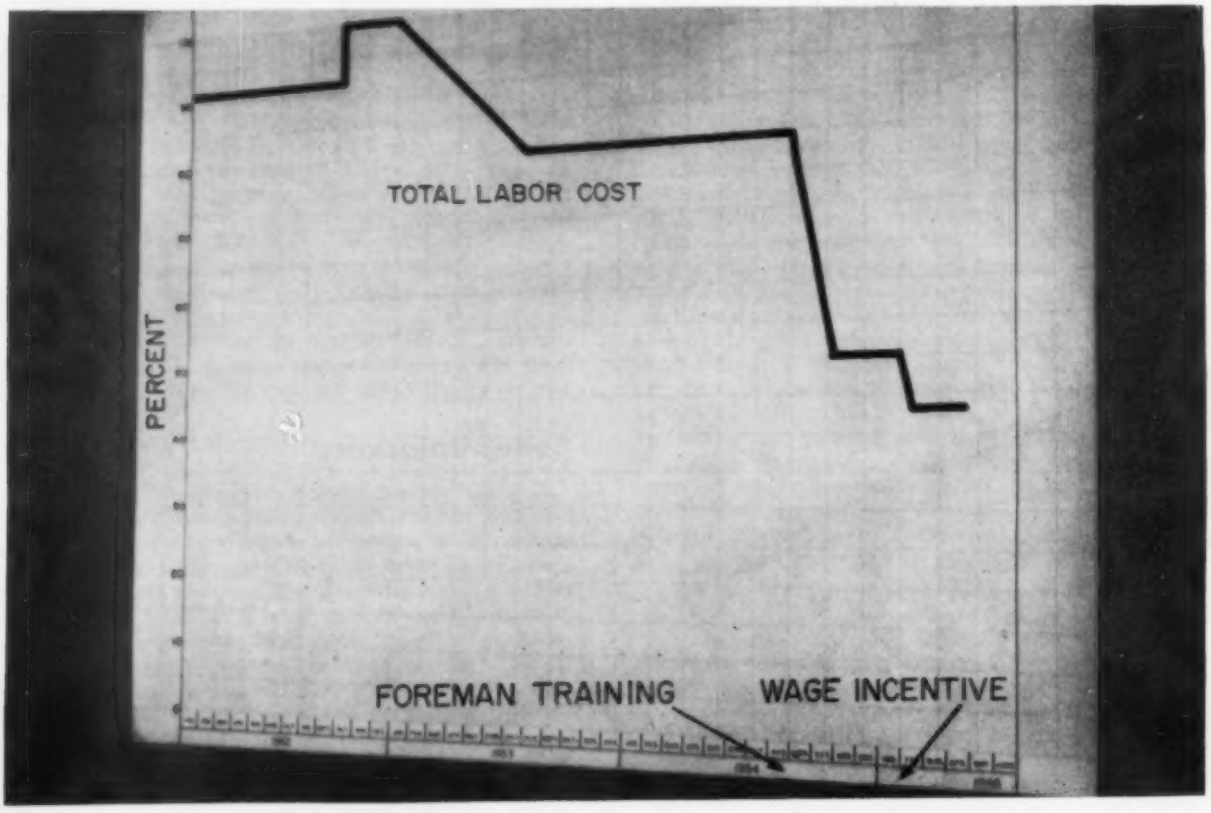
The present price of coal, coupled with the efficiency and low operating cost of modern cleaning equipment, is setting the stage for an unexpected bonus for a number of bituminous mining companies. Old refuse piles are the key. Where they are made up of material derived from hand picking, or from the relatively inefficient washers of years ago, many of them contain an appreciable percentage of good coal—enough so that some companies already have installed equipment for processing it and others are planning to do so. If you have an old pile, better look into the situation. You might have something really worth while.



▲ TONS PER MAN UP

▼ LABOR COSTS DOWN

These are Warner Collieries' results from applying tested principles of industrial engineering to mine operation. Here's the step-by-step procedure for setting-up a workable program that can cut your costs 10 to 40%.



How Industrial Engineering Can Reduce Mining Costs

By VICTOR HURLEY, Superintendent
The Warner Collieries Co., Mammoth, W. Va.

COST OF PRODUCTION can be reduced 10 to 40% by any mining company solely by the proper use of industrial engineering principles. At a new mine of the Warner Collieries, for example, total labor cost dropped $1.00 a ton within 6 mo following the application of industrial engineering methods.

Today, now that a vigorous competitive market is back, a company's ability to cut its cost is much more important. Many firms face the danger of being eliminated as marginal producers unless they can make drastic reductions in their cost. Many companies revert to desperation measures such as cutoffs, but that is not the answer to the problem.

Contrary to what many people believe, industrial engineering is not just a matter of making time studies. Actually, it includes the establishment of cost, delay and supply controls, and should play a major role in planning a company's future production and marketing of coal. A well-established industrial engineering department should be the nerve center of a company, because only through the application of industrial engineering can methods, costs and delays be properly analyzed and controlled.

"Control is to exercise a directing influence over," says Mr. Webster. Probably all coal companies maintain a fairly accurate record of their costs, but there is a vast difference between a record of costs and controlling costs. I like to think of a record of costs as a post-mortem. By the time it is compiled it is too late to reduce them. Controlling costs is a process of reducing and predicting costs. It enables top management to put its finger on trouble areas immediately and provides a tool that can help guide the actions taken to eliminate trouble.

SETTING-UP COST CONTROLS

In setting up a cost-control program, it is first necessary to break down the total cost of production into its various components, such as overhead, supplies, labor, etc., and then analyze each one individually. Many cost factors are fairly uniform and easily predicted, such as various rentals, taxes, labor benefits, and certain overhead items. The most difficult items to predict are labor cost and production, and they are the most important in the cost structure of producing coal. Therefore, I shall concentrate on the industrial engineering principles which lead to the accurate prediction of production and to the reducing and stabilizing of labor costs.

The usual action taken to lower labor costs consists of making sudden slashes or equipment changes. Such steps are working on the effect. They seldom get at the cause. "In short, it is the technique of perpetually pumping water out of the bilge without repairing the hull." These desperation methods of cost reduction are evidence of lack of control.

PRODUCTIVITY THE KEY

The key to reducing labor costs is more productivity per man. Basically, there are two ways to do this:

1. Put better equipment into service.

2. Install better methods, and encourage men to develop more skill and put out more effort.

The first has changed the mining industry tremendously in the past 15 yr, but it is costly and quite often difficult for a relatively small operator. The second method of labor-cost reduction is cheaper than the first, is more lasting and brings about the first step to cost control.

Changing the working habits of men sometimes is quite difficult because they immediately are suspicious of the motive behind the changes. Many men fear that an increase in productivity per man will result in reduced working time or a layoff. Changes must be made gradually and may take as long as 1 or 2 yr to complete. Many fears can be dispelled by explaining to the men the net result of the changes as they will be affected. A successful cost-reduction program can result in more working time, actually, and more men being employed because markets will expand for companies that are able to reduce their costs sufficiently. A classic example of this principle is the Ford Motor Co. In 1909, less than 11,000 Model T's were sold for an average price of $950. Henry Ford then began changing methods and established mass production with an assembly line. In 1914, just 5 yr later, he doubled his employees wages; yet sold 248,000 Model T's for $490, about half of the 1909 price.

USING ASSEMBLY-LINE MINING

Coal mines can be put on an assembly-line basis also, with the same result achieved by Henry Ford. Of course, changes in natural conditions, such as the top and bottom condition, coal height and seam characteristics, make the job of setting-up so-called "assembly line" methods difficult, but by no means impossible. In fact, it is much easier than you can possibly imagine. Natural conditions cannot be changed, but their effects on production, except with extremely unnatural conditions, can be measured and predicted and work methods changed to fit the various combinations and conditions. Measurement and prediction is the basis for increasing productivity per man.

MANAGEMENT EDUCATION VITAL

The first step in organizing a cost-reduction program through industrial engineering is to educate all levels of management on the purpose, scope and principles of the program. The industrial engineer's primary tool is time study, and management men should thoroughly understand time-study methods and results. Only in this manner will they trust and be able to apply the work standards that grow out of time study. Just one diffident member of top management can retard the program or even sabotage it out of existence. Mine management must understand the program to be able to properly answer the questions of their men. Selling of the cost-reduction program to both men and management is vitally important if its maximum benefit is to be obtained for all concerned.

The next step is to train time-study observers to collect the necessary data. The men should be chosen carefully from within the company. While

Adapted from a paper presented at the 1955 Spring Meeting of the West Virginia Coal Mining Institute, June 24-25.

higher education is not needed, observers should be familiar with mining and should have a good personality, because human relations play a major role in their work. Many mine foremen or section foremen make excellent observers.

TIME-STUDY ALL PHASES

Every phase of work concerned with mining is time-studied. Each phase is broken down into as many simple, short elements of time as possible. For instance, "pick up shovel" will become an element even though it may only take 0.05 min to perform. The separate elements then are timed in the various conditions prevailing at the mines until normal times can be assigned to them for each condition.

This method of time study is called the "Standard Data Method," and is much more flexible than the "Direct Time Study Method," in which individual time studies are analyzed separately. By using the Standard Data Method, the industrial engineer is able to establish methods of performing a job that are more effective than the methods being used, merely by rearranging the sequence of element times to make better use of a helper or of a man's location.

All work-element times fall into one of two groups: constants or variables. A constant element time is one that is either not affected by conditions, or is affected in a predictable manner. The element time of "pick up shovel" is considered a constant because one man in a crew should perform it in the same time as another crew member, or even a man in a different mine. The only condition that could affect this element is height, and the difference caused by a change in height can easily be measured. A variable element time is one that cannot be predicted, such as breaking a thick slate with a hammer. Actually, very few variables occur in coal mining, and they can be averaged fairly accurately.

WORKING STANDARDS ESTABLISHED

After element times have been established for all phases of coal production, working standards can be set up. The standards are made by adding together all the element times necessary to perform a cycle, such as cutting or loading. The order of the elements are arranged so as to minimize delay time within the cycle. Then the various cycles are balanced as closely as possible by taking certain work, such as rock-dusting, from one cycle and adding it to another. Balancing of the cycles is very important for obvious reasons. A loading crew should not load 10 cuts if only five have been prepared. If loading is twice as fast as preparation, it only means that the loading crew will waste half its time.

Working standards must be made up to fit all the combinations of equipment and conditions in the mine. The standards normally can be summarized in just a few charts covering a wide range of condition changes and equipment variations.

Once the working standards are established, the methods of reducing labor costs become easily apparent. The standards show the exact number of men needed, and what production can be expected from them. Over a period of time, possibly as long as 2 or 3 yr, the working force should be rearranged until standard-size crews are established. Then their methods of work should be altered until they conform reasonably closely to the standard methods. This phase of the program, consisting of rearranging the crews and altering their methods, will appreciably lower the labor cost.

PAY INCENTIVES CUT COSTS

The Society for Advancement of Management has established the fact that the average worker can be expected to produce only 75% of a normal day's work with no form of incentive while, with an incentive, the same worker will average approximately 115% of a normal day's work. This is an increase in productivity of 53%. In other words, an incentive can reduce fixed overhead costs, such as salaries, by 53%.

Thus, the next logical step in a cost-reduction program is to install wage incentives. Installation of incentives not only reduces costs, it also makes the prediction of future costs and production much more accurate. A fair wage incentive will give workers the opportunity to increase their wages by at least 25%. It will pay workers the same percentage of increase in wages as the percentage of increase in their effort over the standard pace.

Actually, incentive earnings paid to the men do not increase the labor cost, but make it become virtually a constant. For example, if at 75% of standard the labor cost is $1.33 per ton, at a standard pace the cost becomes $1.00 a ton. Beyond this point, say at 115% of standard, the cost becomes 85c per ton, but the 15c saving is paid back to the men. This is the 15% increase in wages for 15% more work. In other words, the labor cost becomes fixed at $1.00 per ton, a fixed cost 33c lower than it would have been with no incentive.

Calculations for wage incentive are based on time rather than production. Thus, the incentive is paid on additional effort and skill, which is the only fair measure of a man's performance. Conditions, type of equipment and mining plan do not affect the worker's opportunity to make additional earnings because those factors alter the standards. In other words, a crew working in 3-ft coal with bad top conditions can make just as much incentive pay as a crew working in 6-ft coal with excellent conditions. Delays that cannot be prevented by the men, such as equipment breakdowns and power failures, do not subtract from the premium pay earned. During these delays, the men are taken "off standard" and receive only their base pay. Of course, the men's base wages are guaranteed.

ACCURATE FORECASTS FEASIBLE

Incentive is the key to accurate predictions, because the labor cost for a given set of conditions and equipment remains almost constant. "Blue Mondays" are eliminated and production also becomes more constant. The only factors that will appreciably affect labor cost and production are changes in equipment, mining plan or conditions, and breakdowns.

Changes in cost and production resulting from revisions in equipment and mining plan can be very accurately calculated beforehand by using the standard data established by time studies. Those caused by changes in conditions can likewise be calculated in advance with proper prospecting and diamond drill core information. Of course, there normally are changes in local conditions that are not established by prospecting and drilling, but it is reasonable to believe that they would not alter the prediction of costs and production by more than 10%. In most seams, the percentage of error should be much less.

Changes in cost and production because of breakdowns are the most difficult to predict. A program for equipment overhauls, preventive maintenance and scheduled lubrication should be installed at the very beginning of the cost-reduction program. Mechanical failures cannot be eliminated, entirely, but they can be minimized to the point where they won't vary the cost by more than 5%. Once the percentage of delay time has been calculated for several months, the error in cost prediction can probably be cut to 2% or less.

After standard data and standard costs have been developed for the entire mining operation, long-range pre-

dictions of total costs and production can be made. Those predictions should not vary with the actual performance by more than 10%.

REPORT SYSTEM NECESSARY

The final phase of a cost-reduction program is setting up a system of reports and controls which will enable management to maintain low costs and point out ways to reduce them even further. Controls should furnish a daily comparison of standard and actual costs, broken down into the various subdivisions making up the total. Waste dollars should be listed and broken down to show the causes of the various cost fluctuations. The controls should state, in dollars, what each delay costs. Controls lift a large portion of the burden off top management, because they not only point out the trouble areas in a cost structure but also show to what lengths management can go to correct them. They eliminate much of the guesswork and hunches often found in managerial decisions. Control reports are the foundation of scientific management.

INDUSTRIAL ENGINEERING SLASHES MINING COST

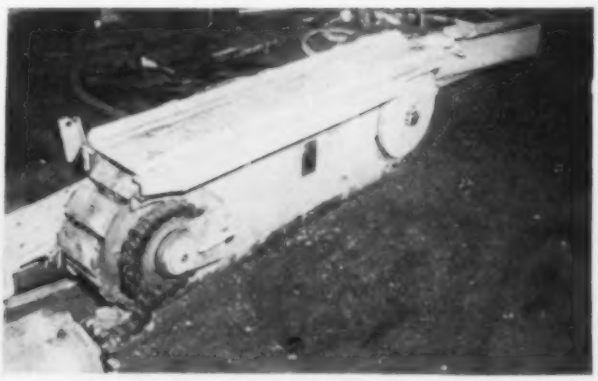
The Warner Collieries Co. started a cost-reduction program based on the use of industrial engineering principles 3 yr ago. It took 2 yr to adapt the principles we were using to the coal industry and work out many of the problems that are unique in coal mining. During this period, only a few benefits were derived from time-study data. However, in January, 1953, a program for rebuilding equipment, preventive maintenance and scheduled lubrication was begun and costs gradually came down as delay time was brought under control. The average delay time charged to equipment failure was sliced from 25% to less than 5% of a shift.

During the summer of 1954, time-study data collected 2 yr earlier was put into use in the form of standard planning for a new mine. All the crews and daymen were laid out in advance, along with a prediction of costs and production that later proved to be quite accurate. When the mine was opened, only the number of men called for in the standards was put to work. Immediately, costs started falling. In August, all foremen at the mine were brought through the standards department for a training program. Time studies were started in November, and in 3 mo the necessary data was accumulated to set up work standards for the entire mine. On Feb. 1, the wage incentive program was installed. By Feb. 15, the tons per man on the payroll had risen to 19.7, an increase of over 10-tpm in less than 6 mo. In this same period, labor cost dropped over $1.00 per ton. This made a total labor-cost reduction of 57% since the program began 3 yr ago at Warner Collieries.

FACE OUTPUT BOOSTED

Since it may be natural for many mining men to assume that costs were reduced because the mine is new, let's examine the change in face performance. In the past 2 yr, performance has improved from 17.8 to over 50 tons per man at the face, based on a 12-man crew using the same identical equipment. The increase in productivity was made not only with the same equipment, but also with the same men and supervision. The management of Warner Collieries attributes this phenomenal decrease in cost almost solely to industrial engineering and the change of thinking brought about by this program.

The industrial engineering principles used to reduce production cost for the Warner Collieries Co. will apply to any coal company. The cost of setting-up such a program is nominal in comparison with the results. If you are a marginal producer now, this type of cost-reduction program will put you well into the "black" with no equipment changes. It enables you to take long-range contracts which formerly were untouchable because of high costs or the uncertainty of future costs. In short, the proper application of industrial engineering principles could very easily take the coal mining industry from a slump to a boom, as a result of the lower mining costs obtainable.



Moving Guards Reduce Wear, Last Longer

BECAUSE of a change in design of a crawler guard, mud from the bottom no longer causes crawler treads to wear off and tear off guards of the shortwall-machine trucks at the Ethel Chilton Mines, Inc., Ethel, W. Va. Moreover, the guards are now easily removed to permit cleaning out of any dirt that may accumulate. Guard design was worked out by W. S. Massengill, chief electrician.

Trucks are Joy T-2B5APE units, some of which do double duty as machine trucks and as mounts for motor-driven pumps for hydraulic coal drills.

The left photo shows the new guard lying on its side on the floor near the crawler. The six projections slide down into slots in the side frames. The other photo shows the guard in place. It can rise at least 1½ in should an accumulation of dirt force the treads upward against the yielding guard.

NEW VANSANT (VA.) PLANT receives coal from numerous small operations by trucks arriving on U. S. 460. Trucks dump into 150-ton bin at far end of bridge and coal is elevated by 36-in belt to tipple at right.

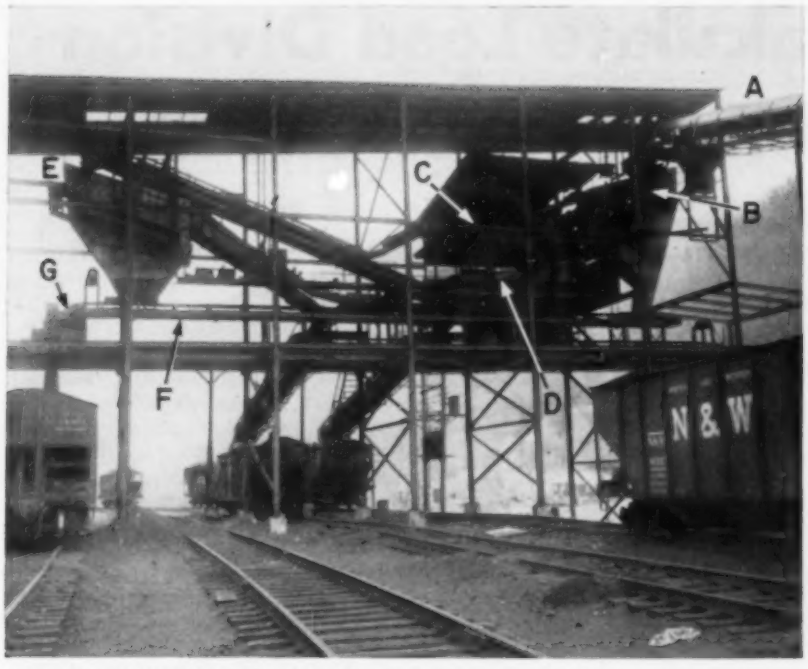
Tipple Serves 13,000 Acres

New central tipple designed to ship 30,000 tons monthly handles coal from numerous truck mining companies in Buchanan County, Virginia. Plant owners furnish diesel generating sets and lease small coal tracts to truck miners.

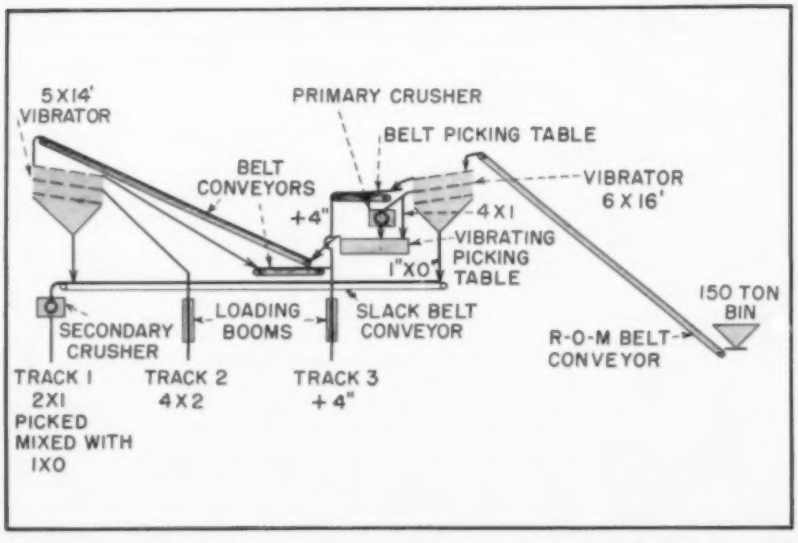
USE OF CONVEYORS of the belt type only and a plant design as simple as is practicable for adequate preparation were goals achieved in the 300-tph tipple put into service Feb. 1 by the Vansant Coal Corp., Vansant, Buchanan County, Va. The company, a new operator in the field, has leases on 13,000 acres of coal lands, all

ALL-STEEL TIPPLE loads three sizes and is equipped with oil-treating equipment. Siding and heating are to be added before winter.

SCALE HOUSE was located on bridge connecting highway and dump bin to save space.



TIPPLE EQUIPMENT in 300-tph plant includes R-O-M belt (A), primary vibrator (B), picking belt (C), vibrating picking table (D), secondary vibratory (E), slack belt (F) and secondary crusher (G). (See drawing below.)



PLANT DESIGN provides seven belt conveyors, including the two booms. Design simplicity was stressed and no flight or scraper conveyors were used.

within 15 mi of the plant. By the end of April, the new operation, which was set up for shipping 30,000 tons per month, was hitting a stride of 1,200 tpd.

Minable seams on the property are the Splashdam and Kennedy, yielding medium- to low-volatile coals of good quality for domestic and steam uses. All the coal is produced by small operators, who lease coal areas, usually 2,000x2,000 ft, together with power-generating equipment. Haulage to the tipple is by trucks owned by the mine operators or by contractors. The plant is located on Levisa Fork of the Big Sandy River, 2 mi upstream from Vansant toward Richlands, and is on the N&W Ry. and U. S. 460.

Alton Aughenbaugh, president of the Vansant Coal Corp., prepared the general plan for the plant. The Persinger Supply Co., Williamson, W.Va., which furnished most of the equipment, did most of the designing. Patnick Bros., Bluefield, Va., erected the structural steel, and the coal company set the equipment in place. William Aughenbaugh, son of Alton, is vice president and general manager of the enterprise.

A space-saving feature of the plant layout is the location of the 20-ton Howe truck scale on the steel bridge connecting the highway and the truck dump bin. Two reciprocating feeders at the bottom feed to a 36-in by 291-ft (c-c) belt conveyor elevating the R-O-M to the plant. This conveyor and all others in the plant consist of idlers made by the Continental Gin Co. and Goodyear belts.

The primary screen is a Simplicity 3-deck vibrator. Plus 4-in from the top deck is picked on a 24-in by 20-ft (c-c) horizontal belt conveyor. Picking of the 4x1 from the second deck of the vibrator is done on a 5x18-ft Simplicity vibrating table. An alternate path to the table is provided through a crusher made by the Krider Machine Co., Duncansville, Pa.

A 24x60-ft (c-c) belt conveyor elevates the picked 4x1 to a secondary vibrator, which is a 5x14 triple-deck Simplicity unit. The two vibrators and the picking table are suspended on wire ropes. A horizontal belt takes the 1x0 from the primary vibrator for mixing with the 2x1 picked size from the secondary vibrator. The mixture is loaded on Track 1, after going through a secondary crusher, also made by Krider.

Tracks 2 and 3 are equipped with 24-in belt booms controlled by 2-ton Yale Cable King hoists. Oil-treating equipment made by Viking has been installed. Reliance motors drive the plant and the reduction gears are Dodge Torque-Arm units. Westinghouse electrical controls are used and the plant wiring is in rigid conduit.

The structure is all steel, including floors and stairs. Before next winter, the sides of the plant will be covered with sheet metal and the picking-table areas will be separately housed to facilitate heating.

Power at 275-v DC for the 15 small mines delivering to the Vansant Coal Co.'s plant is supplied by nine diesel-electric sets owned by the coal company. The engines are General Motors Type 671 and the generators 75 and 90 kw. The truck-mine operators own their shortwall machines, and for the most part they haul from face to portal with rubber-tired cars pulled by locally made automotive tractors electrically powered through drag cables.

How to Calculate Load Division On DC Mine Feeder Circuits

. . . A step-by-step method for making certain your circuit breakers are set properly for maximum safety and top efficiency

By L. H. HARRISON, Mining-Electrical Engineer
U. S. Bureau of Mines, Birmingham, Ala.

THE NUMBER OF MINE FIRES originating in electrical circuits appears to be increasing; therefore, inspectors and safety men are giving considerable thought to methods for preventing such fires. The installation of circuit breakers or other rapidly acting protective devices is being advocated to minimize the hazard of fire. However, to the mine operator who does not have the service of experienced engineers, such installations present many problems.

It is regrettable that, in some instances, considerable money has been spent for automatic circuit breakers which have given disappointing results. This is largely because the circuit breakers have been installed in accordance with general standards and without proper consideration of the specific conditions involved in individual situations.

Two types of circuit-breaker installations, required in any mine of appreciable size, are (1) stub-end feeder installations, consisting of open-end feeders or trolley circuits fed from the outby end and (2) multiple feeder installations where power may be fed through the breaker from either side.

STUB-END FEEDER INSTALLATIONS

The installation of circuit breakers on stub-end feeders is comparatively simple. These usually consist of a breaker providing short-circuit protection for a feeder having a concentrated load and probably a haulage locomotive operating inby the circuit-breaker, as shown in Fig. 1. Three things are required for the successful operation of such a circuit-breaker installation.

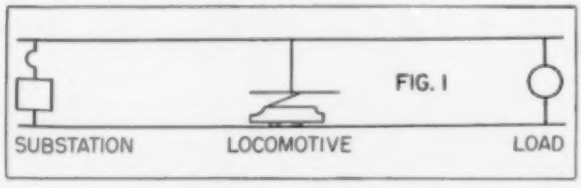


FIG. 1

1. The circuit breaker should have ample capacity to carry the load current continuously over the operating cycle without excessive heating.

2. The trip-setting range of the breaker should be high enough to permit setting the breaker to trip only on currents above the peak values incident to the normal operation.

3. The resistance of the feeder system, including feeder, trolley, and bonded track, should be low enough to permit enough current to flow to trip the breaker under short-circuit conditions. In determining this, some allowance should be made for resistance of the short circuit itself, as faults of this kind are not always caused by solid (no-resistance) contacts. When an arc is formed by the contact between the trolley and rail, for example, the arc may add appreciable resistance to the circuit and thus limit the current available to trip the circuit breaker.

If these conditions are met, satisfactory results may be expected of this type installation with a reasonable amount of maintenance and occasional checking.

MULTIPLE FEEDER SYSTEMS

The proper installation of circuit breakers on multiple feeder systems is much more complicated than on stub-end feeders.

Installations of this kind may be divided into two general classes: (1) multiple feeder systems with loads taken off at only one point on the system (as shown in Fig. 2) and (2), multiple feeder systems with loads taken off at more than one point (Fig. 3).

Calculation of load division for a concentrated load is relatively simple, as the amount of current taken from either source at any time will be inversely proportional to the resistance of the circuits involved. This assumes the same voltage at each source.

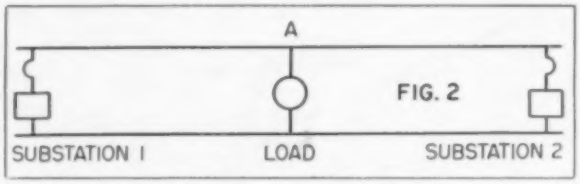


FIG. 2

Thus, in Fig. 2, if the resistance of the circuit from Substation 1 to Load Point A is 0.104 ohm and from Substation 2 to the same point is 0.208 ohm, two-thirds of the amperes will be furnished from Substation 1 and one-third of the amperes from Substation 2. With any set of resistance values, the percentage of the total load from Substation 1 would be obtained by dividing the resistance of the circuit (trolley, feeders, and bonded track) from Substation 2 to the load, by the total resistance of the comparable circuit between Substations 1 and 2, and multiplying the result by 100, thus,

$$\frac{\text{Resistance Substation 2 to load}}{\text{Total resistance Substation 1 to Substation 2}} \times 100 = \text{per cent load}$$

or as shown in the example above $\frac{0.208}{0.312} \times 100 = 66\%$ of the load from Substation 1.

The foregoing may be all that is necessary to know to determine the proper circuit-breaker settings for a mine. More often, however, an operator will face a condition where loads are taken from the system at more than one point, and it is necessary to determine the division of load to determine the proper circuit-breaker settings. Such a condition is illustrated by Fig. 3.

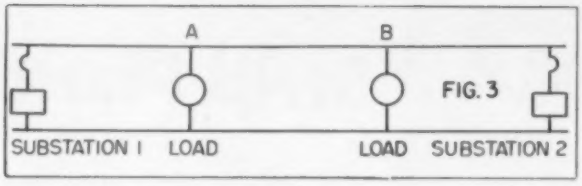


FIG. 3

The division of load here can be determined by first making a trial calculation with only one of the two loads connected and then making some simple adjustments, as will be shown.

The following calculations were made as part of a study to determine substation locations at a large mine, and the values used are actual values as nearly as they could be determined under practical operating conditions:

The load at A (Fig. 3) was 1,154 hp. With a load factor of 20%, the current, would be 885 amp for this load.

The load at B was 1,336 hp, which on the same basis represents a current of 1,020 amp. The resistance of the circuit from Substation 1 to point A was 0.0208 ohm, and the resistance to Point B was 0.20705 ohm. The resistance of the circuit from Substation 2 to Point B was 0.10152 ohm. The resistance A to B was 0.18625 ohm. Since the largest load was connected at Point B, the first calculation was made to that point.

Total ohms Substation 1 to Substation 2:

$$0.20705 + 0.10152 = 0.30857 \text{ ohm.}$$

Portion of load from Substation 1 with no load at (A):

$$0.10152 \;/\; 0.30857 \times 1{,}020 = 335.58 \text{ amp.}$$

Portion of load from Substation 2, no load at (A):

$$1{,}020 - 335.58 = 684.42 \text{ amp.}$$

The voltage drop to Point B, with the above load distribution and a normal load of 885 amp at A, would then be calculated as follows:

885 + 335.58 = 1,220.58 amp from Substation 1 and 684.42 amp from Substation 2.

	Volts
Voltage drop Substation 1 to (A): 1,220.58 × 0.0208 =	25.388
Voltage drop (A) to (B): 335.58 × 0.18625 =	62.502
Total voltage drop, Substation 1 to (B):	87.890
Total voltage drop Substation 2 to (B): 684.42 × 0.10152 =	69.482
Difference:	18.408

We know, of course, that the load division must give the same voltage drop from each substation to the point where the load is connected to the common feeder, in this case at B. We also know that any reduction of amperes in one feeder must be compensated for by a comparable increase of amperes in the other, and as the resistance of each feeder is different the change in voltage drops will be proportional to the resistance of the two circuits.

Change in voltage drop required:

$$0.10152 \;/\; 0.30857 \times 18.408 = 6.0562 \text{ v}$$

Amperes to be transferred to effect this change:

$$6.0562 \;/\; 0.10152 = 59.65 \text{ amp}$$

From this we obtain a new distribution of load by transferring 59.65 amp from the load on Substation 2 to the load on Substation 1.

The new load: 335.58 − 59.65 = 275.93 amp from Substation 1, and 684.42 + 59.65 = 744.07 amp from Substation 2.

It is now a simple matter to check the accuracy of the foregoing solution, as follows:

Load from Substation 1: 885 + 275.93 = 1,160.93 amp

Voltage drop to (B): 1,160.93 × 0.0208	= 24.147
275.93 × 0.18625	= 51.392
Total:	75.539 v

Load from Substation 2: 744.07 amp.

Voltage drop Substation 2 to (B):

$$744.07 \times 0.10152 = 75.538 \text{ v}$$

Since the voltage drop from each substation is approximately the same, this load distribution is correct.

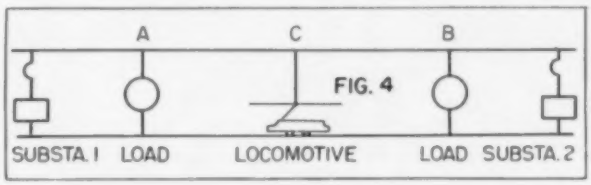


FIG. 4

MORE THAN TWO LOADS

If now we assume a locomotive operating between A and B (Fig. 4), the same method can be used. For our purpose we will place the locomotive halfway between A and B, although it can be at any point between the two.

By inspection we can see that the load probably will divide at point B. This can be determined readily by calculating the drop from Substation 1 to the locomotive with all load to that point included, and the voltage drop from Substation 2 to B. The locomotive is assumed to be taking 300 amp from the system. Using the same resistance values as for the previous conditions, the distribution can be calculated as follows:

Load from Substation 1: 885 × 0.0208 =	18.408
300 × (0.0208 + 0.0931) =	34.170
Total drop:	52.578 v

Load from Substation 2: 1,020 × 0.1015 = 103.53 v drop.

Difference in voltage (C to B): 103.53 − 52.57 = 50.96 v

The additional voltage drop required:

$$0.1015 \;/\; 0.3085 \times 50.96 = 16.766 \text{ v}$$

Amperes to transfer: 16.766 / 0.1015 = 165.18 amp

We can now check the distribution as follows:

Volts drop Substation 1 to (B):

885 × 0.0208 =		18.408
300 × (0.0208	0.0931) =	34.170
165.18 × (0.0208	0.1862) =	34.192
	Total:	86.770 v

Volts drop Substation 2 to (B):

(1,020 − 165.18) × 0.1015 =	86.764

This again indicates that the distribution of 1,350 amp from Substation 1 and 855 amp from Substation 2 is approximately correct for this particular load condition.

Reasonably accurate calculations of load division can be made in this manner. The figures are based on feeders, trolley circuits, and bonded tracks being maintained at a condition of peak efficiency. The accuracy of the results will not usually be greatly affected, however, by a lower standard of maintenance, as this will influence all sections of the mine in about the same proportions.

If the mine operator is fortunate enough to have available a millivoltmeter and suitable shunts, some tests can be made to determine the maximum current peaks during the operating cycles. These would be very helpful in determining circuit-breaker settings and to check the calculations. For this type of work a graphic millivoltmeter will furnish charted information that will be invaluable in helping to determine proper circuit-breaker locations and settings.

The necessity for such calculations and studies cannot be over-emphasized if satisfactory results are to be obtained with reclosing breakers on multiple feeder systems.

DELAYED RECLAMATION of highly acid spoils results in better ground cover, studies have shown. Note difference in growth in "Canyon Experimental Area" of West Virginia after 1 yr of delay (above) and after 3 yr (below).

Strip Planting

West Virginia "test spoils" show how strip lands can be more easily restored to productiveness. Black locust is best all-around tree species for spoil banks. Delayed planting important where highly acid conditions exist.

By O. D. WYATT
Morgantown, W. Va.

"MOST STRIP MINE SPOILS make better sites for rapid growth of trees than do nearby soils." This is one of the conclusions drawn from a study of "test spoils" scattered throughout West Virginia, now one of the leading states in the production of strip coal. The modern stripping era dates back less than a quarter of a century but in that time production has grown to the point where one-fifth of the output since 1940 has come from stripping operations. This in turn has created a major reclamation problem.

Legislation providing for strip-land reclamation was adopted by West Virginia in 1939 and provided for posting a bond of $300 for the first and $150 for each additional acre to be stripped to guarantee the fulfillment of land reclamation. The act was changed in 1945, raising the bond to $500 an

WHEN PLANTING IS SCIENTIFIC, rich growth is possible and hillsides lose their former identity as spoil banks. The well-formed red pine, foreground, were planted 6 ft apart. At the rear, black locusts are thick and thriving. Both are 9 yr old. (Photos Department of Agronomy and Genetics and Div. of Forestry, West Virginia University.)

For Better, Faster Growth

acre with a minimum of $1,000. Once again, the state legislature is concerned with spoil reclamation and if a proposed bill is passed, the bond will be doubled.

The legislature is not the only group concerned with spoil reclamation. The agricultural experiment station at West Virginia University has recommended specifications for planting stripped-over areas since the 1945 act. Two years prior to that, the station began conducting long-range experiments on such areas.

BETTER FOR TREES

With reservations, S. L. Galpin, hydrologist at West Virginia University, concludes that most strip-mine spoils are better for rapid tree growth than neighboring natural soil. This finding stems from observing various "test spoils" scattered over the state. But it was also found that highly acid soils resulting from sulphur above the coal roof, may have to leach for 3 to 5 yr before any seeding is attempted.

Growth, especially of trees, is comparatively young on the coal spoils of West Virginia because of their relatively recent origin. Iron-ore spoils of the state, now 70 to 150 yr old have therefore been studied to determine rate and nature of growth. The Division of Forestry and the Department of Agronomy and Genetics of the Experiment Station report that trees 18 to 65 yr old grow as well on iron-ore spoil banks as on natural, undisturbed areas.

A stand of mixed oaks in Preston County was found to be growing "somewhat faster than others of the same age on nearby undisturbed areas." This suggested that "many of the younger coal-stripped banks will, in time, also produce satisfactory grazing conditions."

TEST BEFORE PLANTING

Individual testing of soil is necessary before attempting to seed a spoil, Mr. Galpin advises. Even soil testing within a spoil is necessary because some spoils cover a wide area with conditions varying from one spot to another. The best procedure for finding a type of vegetation that will grow well in a particular spoil area has been to observe the surrounding areas which have not been stripped. "There's no use trying to grow trees or legumes that normally wouldn't grow in the area anyway." Oddities, such as the bald cypress and European alder, have been planted on West Virginia spoils, but intentional planting of these types was not recommended by E. H. Tryon, silviculturist at West Virginia University.

Trees are important to the reclamation of spoil. However, because of varying conditions, grasses and legumes are better for stopping erosion, Mr. Tryon states. "Uneven soil upturnings and uneven mixture of minerals in the spoil cause more unevenness of growth in spoil banks than in regular fields."

BLACK LOCUST ADVANTAGES

Black locust is the best all-around tree species for spoil banks, Messrs. Tryon and Galpin agree. It grows fast, its leaves fall and start to build up a layer of humus, and it adds nitrogen to the soil. Mixed plantings, including some legumes, are better than planting a single species. The important thing is to get something growing on the spoil bank, regardless of the crop at first.

"Planting trees is far more successful than seeding them," Mr. Tryon feels. If seeding is necessary, black locust mixed with clover seed makes a good combination for spoil planting. The size of the area to be covered may necessitate seeding. Tractor-drawn planting machines can plant up to 10,000 trees a day, depending on terrain, typography and type of spoil, whereas "about the best one man can do by hand is 400 or 500."

ACID SPOILS DIFFICULT

The "Canyon Experimental Area," in Monongalia County, northern West Virginia, has been excellent for testing highly acid spoils. Grasses were planted in parallel rows at even intervals with legumes perpendicular to them. "From a practical point of view," Mr. Galpin states, "3 to 5 yr leaching resulted in better and faster growth." The Canyon experiment has also indicated that "kudzo" grows well on highly acid spoil.

The most successful growth for highly acid soil has been birdsfoot clover. Orchard grass, red top, timothy, and most of the clovers including lespedeza sericea and Korean lespedeza, have been highly successful in moderately acid soil. Alfalfa, clover and orchard grass have grown well in heavily limed soils.

Findings by Mr. Tryon generally coincide with those of Mr. Galpin. He says: "You can't expect anything to grow well for perhaps 10 to 40 yr on spoil with an acidity reading of below pH 4." Virginia pine, pitch pine, red pine, white pine and black locust have all failed on such spoils.

On spoils with a reading between pH 4 and 5.5, growth is good for pines, black locust, Norway spruce and European larch.

"Spoils with a pH of 6.5 or above are capable of supporting good hardwood forests." On the other hand, little success has been had with hardwoods in northern West Virginia because animals, especially rodents such as rabbits and mice, eat the tender young sprouts before they have had a sufficient chance for survival.

CHEESE BOX PLANTING COSTLY

When discussing strip-land reclamation many land owners ask, "What should be done with cheese boxes?" There has not been much done with this type of highwall, which results from stripping completely around a hilltop or knob, Mr. Galpin states. When operators make one or two cut strips completely around a hill, landowners usually want a ramp to the upper reaches of the land so that their cattle can use it for grazing. "Cheese-box highwalls are too expensive to plant. Nature, in time, will do a good job of taking care of them."

LEVELING DAMAGES SPOILS

Experiments on the effect of leveling strip spoils, in the hope of better and faster growth of vegetation, were initiated in Ohio in 1946. G. A. Limstrom, Central States Forest Experiment Station, found that grading of strip-mined lands "showed definite harmful effects . . . on the early development of planted trees. When there is too much rain, graded banks tend to become much more saturated and water-logged than ungraded banks. During periods of drought, graded banks are not able to use what little rain occurs." These statements are based on research findings which show that: "The principal causes of poor site conditions on graded banks are compaction of surface materials by grading machinery and cementation of the surface as a result of poor drainage."

ROOF-BOLTING CREWS in Lorado mines consist of three men. Here, two men drill the hard sandstone roof with new-type percussion drills while the third tightens a bolt with an impact wrench. Drilling operation is completely dust-free.

Dry Percussion Roof Drilling Successful in Hard Sandstone

HARD SANDSTONE ROOF is highly stratified in some places. A fall in solid work taking roof bolts with it (right) indicates how difficult the sandstone roof is in some areas. Working height averages 6 ft.

TRACTOR TRUCK mounts an air receiver and one or two cyclone-filter dust collectors, providing ample space for stopers, impact wrench and roof bolts.

New-type drills prove economical solution to problems of bolting difficult and unusual roof in Lorado Coal's No. 8 mine. Operating advantages include high drilling speeds, low maintenance and complete dust collection.

HIGH-SPEED, low-maintenance, dry percussion drilling of hard sandstone, with all the dust and chips pulled through the hollow drill rod to a cyclone-filter collector, has put roof-bolting on a practical and economical basis in the No. 8 mine of the Lorado Coal Mining Co., Lorado, Logan County, W. Va. The drills are Holman "Dryductor" units made by the Goodman Mfg. Co. The coal company installed the first Dryductor in March, 1954, and now has standardized on them, employing eight in No. 8 mine and two in No. 5 mine.

Roof in No. 8 mine, which operates in the Upper Chilton seam, is both difficult and unusual. Although an extremely hard sandstone, it has numerous cleavage planes and appears to be extremely brittle. Crossbars are necessary, and the company's standards call for placing 2x8-in by 16-ft bars on 4-ft centers. Working height averages 6 ft and the coal 5½ ft, not including a middle band that is not continuous.

Cutting is done in four of the six sections with Jeffrey 29UC crawler-mounted machines, while Goodman 512 shortwalls are used in two sections. Cuts average 8½ ft. Airdox is employed for shooting because of better loadability and the production of more lump and less fines. Joy 14-BU machines load into Joy 42-E shuttle cars carrying normal loads of 4 tons. Elevators discharge to mine cars.

Production from No. 8 is 3,300 tons of clean coal from two mining shifts and is about 75% of the company's output. Coal from both Nos. 8 and 5 mines is prepared in the No. 5 plant, where the 6X0 is washed in a Jeffrey Baum jig.

Supporting the wood headers entirely by posts was impractical from the standpoint of clearance and economics. The centers of the headers, at least, had to be supported by roof bolts. Experiments in drilling the sandstone soon indicated that rotary drilling was completely impractical. Percussion wet drilling proved costly and also was a nuisance because of the detrimental effect of water and mud on the men's working efficiency.

TESTS PROVE ADVANTAGES

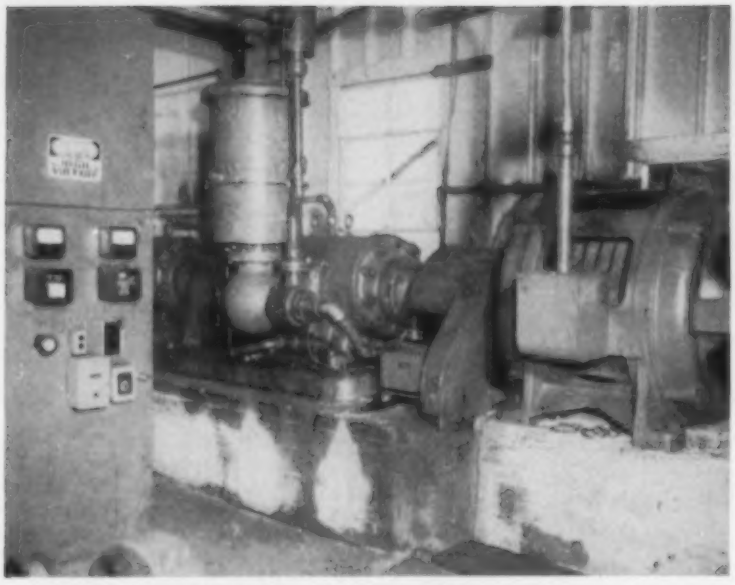
Percussion dry drills and dust collectors of several types were tried. Testing of the Holman Dryductor proved it far superior for conditions at No. 8 mine. Operating advantages include a dust collector that is entirely built-in; short drill setup time; minimum drill-rod changes; dust completely trapped; high drilling speed; and relatively low equipment maintenance.

The Holman Dryductor stoper is equipped with a telescopic leg and can rise 73 in, thus providing ability to drill maximum-depth holes with a minimum of steel changes. Drill rods have ⅜-in holes and the detachable shot-peened "Holbit" has a circular-shaped base to seal the hole being drilled. Dust and chips are drawn into the hollow steel through four holes on the face of the bit between the tungsten-carbide wings.

The dust collector is a compact cyclone-type unit equipped with rotating filters. Suction is created by an eductor or, in other words, by a nozzle-type ejector operated by the air pressure. Filters operate for long periods without cleaning or renewal, and the air discharged to the mine is clean, as attested by USBM approval. The Dryductor is so designed that it cannot release dust while drilling and cannot drill unless dust is being removed. A readily detachable container permits emptying the dust, which is done after completing the roof-bolting of each cut. While the container has a greater capacity, it is important not to let it overfill and prevent rotation of the filter.

DRILLS ON MOBILE TRUCKS

An air receiver and one or two dust collectors are mounted on a Joy T-2 truck. In No. 8 mine, two trucks with two Dryductors each work in bad roof sections, which require four bolts per header, headers on 4-ft centers and placed within 2 ft of the face. The other four bolting units working under less fragile roof that requires two 42-in



ROTARY COMPRESSOR located in an outside substation supplies air for roof-bolting several sections in Lorado No. 8 mine. The 1,000-cfm unit has a 200-hp synchronous motor drive.

DUST IS COLLECTED in a detachable container that is easily emptied. Drill will not operate unless dust is being collected.

bolts near the center of the header have one Dryductor drill on each. In No. 5 mine, there are also two trucks with one Dryductor each.

Air at the face is supplied at 100 psi either by a semi-portable compressor on the section or by a stationary compressor installed outside. On Sec. 3 of No. 8 mine, where the photographs were taken, air for the roof-bolting truck with two Dryductor drills is supplied by an Ingersoll-Rand Model 75BH 480-cfm compressor installed near the car-loading elevator. Other sections are supplied by pipe lines from a Fuller 1,000-cfm 125-psi rotary compressor in an outside DC substation driven by a 200-hp synchronous motor.

Trailing air hose from the T-2 truck is 1½-in, with a maximum length of 480 ft. Hose couplings are Punch-Lok put on with banded clamps. Gardner-Denver automatic oilers in the air lines on the T-2 trucks insure lubrication, shutting off the air if the lubricant in the reservoir is depleted. Officials of the mining company credit the low maintenance of the Dryductor drills to this assured oiling system, plus the fact that all dust is collected and none gets into the drill.

Shuck-type "Wedgegrip" ⅝-in bolts, furnished by the West Virginia Steel & Mfg. Co., are used in No. 8 mine. Tightening is done with Chicago-Pneumatic wrenches. Three lengths of steel, 18, 30 and 48 in, are stocked in the coal-company supply house. Where there is a minimum of 5½ ft of working height, the 5-ft hole can be drilled with 30- and 48-in steels.

FAST DRILLING OBTAINED

Tests in No. 8 have shown that the Dryductor, equipped with Holbit, drills hard sandstone faster than the slate encountered in some sections in the mine. With 100 psi maintained at the drill, 436 in of sandstone was drilled in 18.22 min, or the equivalent of 24 in per min, not including time for drill changes. On Sec. 3, three shot-peened Holbits, costing $20 each, drilled for 26 work days and produced 15,302 tons (clean coal) by the time they had been reground several times and their diameter had become too small. Bit cost was ½c per ton.

The number of holes drilled with the three bits was 1,243. The average depth was 43 in and the footage totalled 4,453, of which 65% was in sandstone and 35% in the slate and sandstone combination. At both mines during April, 1955, the total actual mechanical repairs on the Holman Dryductor units, plus the steel and bits purchased, was ¾c per ton.

Three-man crews are used on both the two-stoper and one-stoper T-2 roof-bolting units. Wooden headers arrive at the face with the roof-bolt holes already drilled. As with all face operations in the Lorado mines, the company's industrial engineering department has prepared "standard practice" roof-bolting bulletins for the specific conditions on each section. For a section requiring an average of 4.75 holes (42 in deep) per 8½-ft cut (normally two bolts per header, three bolts at crosscut intersections), the "total standard minutes" per cut is specified at 27.23.

BOLTING TIME STANDARDIZED

Total standard minutes includes a fatigue time allowance. Components of the specified 27.23 min are:

1. Tram stoper trucks to next place to be roof-bolted, 3.42 min.

2. Move headers to face, get jacks, place headers on jacks and tighten, 4.56 min.

3. Prepare to drill, unload drilling equipment and make ready to drill, 1.78 min.

4. Position and drill, 12.54 min.

5. Load tools and prepare to move to the next place, 1.93 min.

6. Miscellaneous, such as, splice cable, repair hose, other minor duties, etc., 3 min.

General instructions in the bulletin state that:

A. The stoper operator is responsible for seeing that worn-out or broken steel or bits are taken outside at the end of the shift.

B. No drilling is to be started in places not sufficiently supported by safety timbers.

C. The operator is responsible for seeing that adequate supplies are on the stoper trucks at the beginning of the shift.

D. Any defects or signs of coming defects are to be reported to the unit foreman as early as conveniently possible.

E. The crew will perform any other such duties as the unit foreman may direct.

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FOREMEN'S FORUM

SEEING all factors, interpreting them correctly, are two steps in . . .

A good supervisor develops his ability to search out facts, then uses them in setting up a course of action—He knows how to make the best possible use of his Powers of Observation

Developing Powers of Observation

YOU HAVE HEARD the old saying, "There are none so blind as those who will not see," meaning that those who deliberately close their minds and eyes to the wonders taking place about them, or those who take only a superficial glance, have shut themselves up in blackest darkness. Their powers of observation are withered and dead.

There are others, however, who have cultivated the valuable habit of looking closely and seeing much. They also have developed the ability to distill truth from what they see. These folks are said to possess keen powers of observation. Note that their powers are two-fold: The ability to see facts, and the ability to interpret them.

A mine supervisor carries a heavy responsibility to develop his powers of observation to the finest edge of excellence. Human lives depend upon how much he sees, how well he sees and how close to the real truth he comes in his interpretation of what he sees. He and his workers can't survive too many wrong guesses concerning roof control, ventilation or other safety-centered operations. And speaking in terms of their pocketbooks, they can't survive too many wrong guesses on getting coal out to the tipple.

The broad subject of this month's Foremen's Forum is brought to mind by a book entitled, "The Birth and Development of the Geological Sciences," by Frank Dawson Adams (Dover Publications, Inc., 1780 Broadway, New York 19, N. Y.; 506 pp; paperbound; $1.95). This history of man's speculations and observations on the origin and structure of the earth, occurrence of minerals, sources of ground water and other natural manifestations also provides examples of the value of observation vs speculation. As

(Continued on p 88)

Effect of Ideas on Production Methods

By R. L. WHELAND, Co-ordinator for Suggestion Plans
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

THE GENERAL BENEFIT that has resulted within our country from the improvement of production methods is well known to all of us. Those basic improvements in the way we do things—the development of new processes, the use of finer tools, more versatile and productive machines—have been sought since the beginning of time to increase the effectiveness of man's efforts.

Improvements in production methods have provided the public with more necessities and, happily, more luxuries. Improvements have given us a higher standard of living.

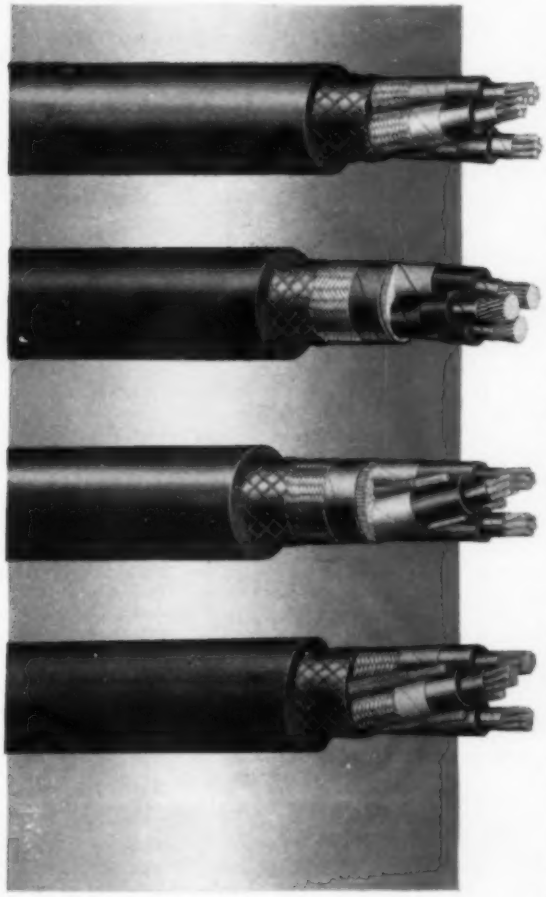
Our American system of free enterprise allows competition in the production of useful items. This is good because it encourages original thinking, and development of ideas for general advancement.

COMPETITION EXISTS

The existence of competition in the in-

Avoid costly "Downtime" with U. S. Royal Shielded Portable Power Cables

Shielded Portable Power Cables, Type SH, are preferred (or generally used) for the distribution of power to portable equipment at voltages above 2000. Shielded cables provide greater protection to the insulation and are safer to handle than other types of portable cables. These cables are of the four types listed below. Where maximum safety is desired, type SH-D cables are recommended.



U. S. Royal SH-A Cables consist of three or four flexible coated annealed copper conductors covered with a semi-conducting tape. Each conductor is insulated with U. S Uskorona-1 oil base compound, and covered with colored tapes and a braided coated copper shield. The conductors are then cabled and covered with a reinforced jacket of 60% black neoprene. The shielded braid over each insulated conductor eliminates corona cutting by static discharge through equalization of surface stresses.

SH-B cables consist of three or four flexible coated annealed copper conductors covered with a semi-conducting tape. Each conductor is insulated with U. S. Uskorona-1 oil base compound plus colored tapes. Conductors are then cabled with jute fillers, covered with a rubber-filled tape, a braided coated copper shield and reinforced 60% black neoprene jacket. The shielding braid protects the men handling the cable in the event of fault currents.

SH-C cables consist of three or four flexible coated annealed copper conductors covered with a semi-conducting tape. Each conductor is insulated with U. S. Uskorona-1 oil base compound and covered with a colored tape. The conductors are cabled with jute fillers and with the specified fabric-covered ground wires in the conductor interstices; then covered with a rubber-filled tape, braided coated copper shield and a reinforced 60% black neoprene jacket. This allows grounding of equipment and provides an adequate low-resistance path for short circuits, thus insuring circuit breaker operation. The grounded equipment provides protection to workmen under fault conditions.

SH-D cables consist of three or four flexible coated annealed copper conductors covered with a semi-conducting tape. Each conductor is insulated with U. S. Uskorona-1 oil base compound and covered with a colored tape and a braided coated copper shield. The conductors, together with fabric-covered grounding conductors, are cabled and covered with a reinforced black 60% neoprene jacket. The conductor shielding, when properly grounded, equalizes surface stresses and draws off all capacity charging currents, insuring safety in handling. An adequate low-resistance ground for the equipment is provided by the grounding conductors.

All shields and grounding conductors, when used, should be properly and thoroughly grounded.

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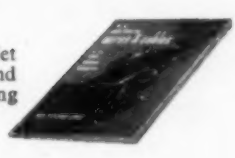
Send for illustrated booklet on U. S. Electrical Wires and Cables for the coal mining industry.



UNITED STATES RUBBER COMPANY
ELECTRICAL WIRE AND CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

US RUBBER

might be expected, our entire fund of knowledge concerning the earth sciences comes from keen observers who were willing to go into the field to look, then to submit to criticism their interpretations of what they saw.

The earliest investigators were limited by their lack of knowledge of chemistry, by the difficulties of traveling to other areas to see different conditions and by their inability to probe into the crust of the earth to any great depth. In the beginning they had to speculate, there was no other course.

But see what pure conjecture sometimes fashions. Here are some of the conclusions men reached in their search for fuller knowledge of their planet, as described by Frank Dawson Adams in his interesting book.

The ancients believed that the mineral onyx is the hardened tears of the Onica tree; that stones reproduced their kind in a union of male and female stones; that precious stones in the earth's crust result from penetration of the earth by rays from fixed stars; that some forms of stone dripped from the moon at night.

Here is the word on earthquakes, as quoted by Adams from a scholar of the Middle Ages:

". . . We shall therefore explain what earthquakes really are and what remarkable consequences result from them. Earthquakes arise from the fact that in subterranean caverns and especially those within hollow mountains, earthy vapors collect and these sometimes gather in such enormous volumes that the caverns can no longer hold them. They batter the walls of the cavern in which they are and force their way out into another and still another cavern until they fill every open space in the mountain. This unrest of these vapors is brought about by the mighty power of the Stars, especially by that of the God of War as Mars is called, or of Jupiter and also Saturn when they are in constellation. When then these vapors have for a long time roared through these caverns, the pressure becomes so great that they break a passage through the surface and throw the mountains against one another. If they cannot reach the surface they give rise to great earthquakes."

Hundreds of years before the birth of Christ the story of the gold-digging ants of India was going the rounds, Adams tell us. Here is Pliny's First-Century version:

"In the temple of Erythrae, there were to be seen the horns of a certain Indian ant, which were then set up and fastened for a wonder to posteritie. In the countrey of the Northerne Indians, named Dardae, the ants do cast up gold above ground from out of the holes and mines within the earth: these are in color like to cats, and as big as the wolves of Aegypt. This gold beforesaid, which they work up in the wintertime, the Indians do steale from them in the extreme heate of Summer, waiting their opportunitie when the Pismires lie close within their caves under the ground, from the parching sun. Yet not without great danger: for if they happen to wind them and catch their sent, out they go, and follow after them in great hast, and with such fury they fly upon them, that oftentimes they teare them in pieces; let them make away as fast as they can upon their most swift camels, yet they are not able to save them. So fleet of pace, so fierce of courage are they, to recover gold that they love so well."

In other versions, the ants are like great dogs, or smaller than dogs yet larger than foxes, but their summertime rivalry with the Indians persists. Speculations like these live for hundreds of years—until some observer refutes them.

Still other theories told of a Golden Tree having its roots at the center of the earth and its leaves and twigs in the outer crust, of common metals "ripening" into gold, of minerals grown from seeds and so on. All these were accepted without question by all save the observers, the fellows who were willing to take to the field to get first-hand information.

Foremost among the early observers was Georgius Agricola (1494-1555), who in his writings did much to straighten out the record on the origin of stones and other geologic matters. He was a physician in a busy Bohemian mining town, and his findings are based upon studies in the field. William Smith (1769-1839) became known as the "Father of English Geology," and he also was a proponent of field observations followed by proper interpretation.

As we sit here thinking about these matters, we see more and more value in well-developed powers of observation. All progress depends upon the powers of observation men bring to bear upon their world. Those who lack such powers are content to report as true the tales manufactured in the imaginings of others. The observant person is the one who can see a need for change, the one who knows how the change should be made. He makes the best kind of supervisor.

Now it becomes our duty to draw this piece together with sage advice on how to develop healthy powers of observation. That is a big order. See if you agree that these might help:

1. Rate your "curiosity quotient." Are you interested in a wide range of ideas? Do you cast bits of reading matter aside, saying "This is out of my field?" If so, you will have to increase your appetite for knowledge in new areas. Don't toss reading matter aside; give it at least a hurried once-over and you may find it has value for you.

2. Learn to draw diagrams. Even the crudest drawing will help you visualize a more or less complicated idea.

3. Learn to take notes. Active brains require large notebooks. Leonardo Da Vinci was one of the keenest observers and most active thinkers of all time, and he was an avid notekeeper. Good notes can be a valuable source of information.

4. Prepare an interpretation of your facts, remembering that all the facts must support your conclusion.

5. Expect searching criticism from other observers. You won't get meaningful criticism from anyone else.

6. Be prepared to alter your stand if the weight of the facts amassed by others wrecks your thesis. Walk away from the wreck, don't die in it.

7. Don't be in too great a hurry to arrive at conclusions. That's how "Old Wives' Tales" and stories about gold-digging ants are born. Be sure you have sufficient facts to warrant a conclusion.

Effect of Ideas on Production Methods . . .

dustrial or business field requires that companies which desire to retain a favorable position continuously improve their production methods.

Although the development of many complex machines has tremendously multiplied man's productive efforts, human effort is still the basic tool in present industrial methods. And improvements can best be made by the person most familiar with the processes and operations involved.

It is an important part of everyone's job to see that up-to-date methods and processes are being used and that steps are constantly being made toward the further simplification of work in his department.

The steps to be taken in analyzing a problem apply whether a person is buying a car, playing golf, or improving a job. In short: (1) Get the facts, (2) Analyze them, (3) Decide what must be done, (4) Act on your decisions, and (5) Follow through on your actions.

To be effective, job improvement must mean continuously studying every part of a given piece of work. Each element must be studied separately in order to eliminate those which are unnecessary and in order to find the quickest and best method of performing each part that is necessary.

The approach used in job improvement is simply a common-sense method of getting to the core of any problem. "Finding out what is wrong with something and correcting it."

PEOPLE'S WEAKNESSES

Fundamental to the approach is some knowledge of the things that affect people. In part, people have three basic weaknesses which must be overcome before a good job can be done: (1) It is human nature to resist change, (2) It is human nature to resist the new, and (3) It is human nature to resent criticism.

All must work together in order to understand that changes are necessary if we are to keep ahead, that "The New" is an attempt to improve on "The Old," and that criticism is helpful.

—Adapted from MEN AND STEEL, Jones & Laughlin Steel Corp.'s employees' publication.

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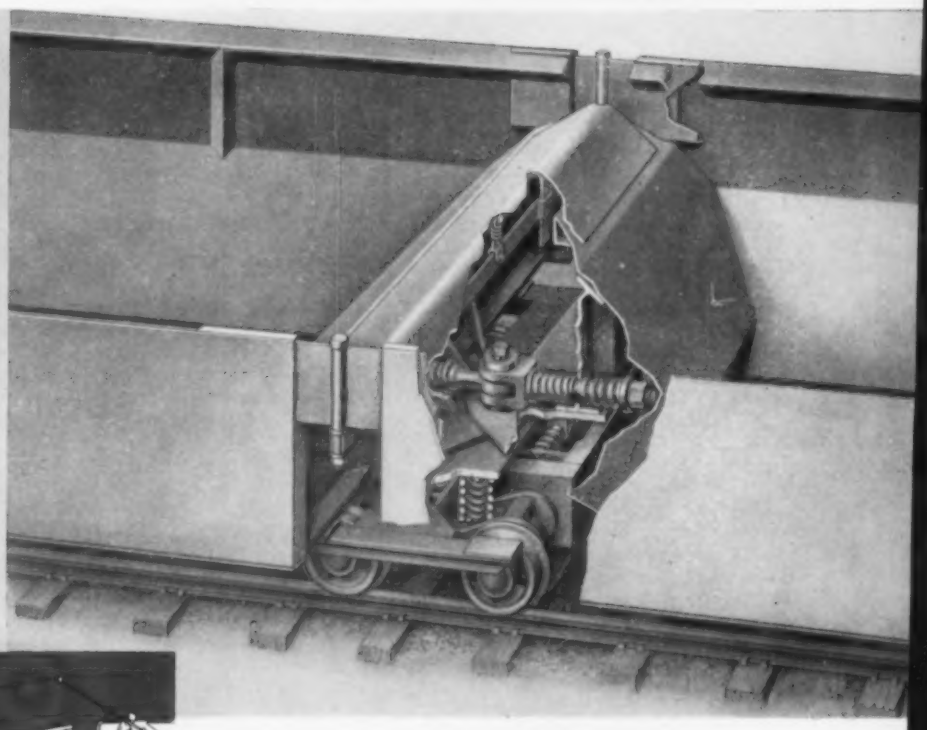
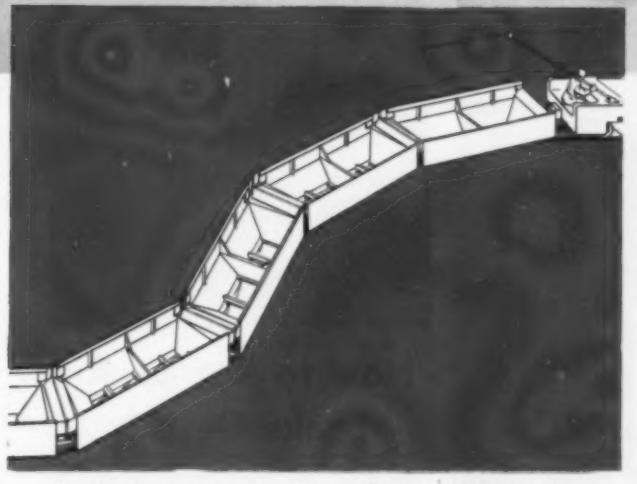
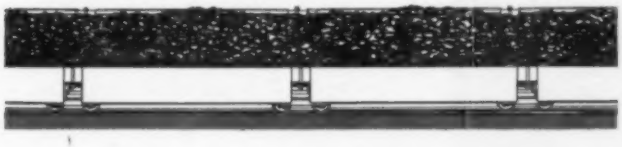




Articulated design permits continuous loading without stopping and avoids spillage between cars.



The revolutionary articulated design of acf "Constant" Mine Trains permits highspeed uninterrupted coal handling from face to dumping point! Without stopping, and without spillage...it can be *continuously* loaded...hauled at unusual speeds...and unloaded! No space between cars...shorter trains have increased capacity! Far less overhang on curves...no wide "turnouts" and extra timbering needed. Most important, here's a continuous haulage system that won't be shut down for repairs. Ask your acf Representative for complete data now!

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acf MINE CARS *for Constant Haulage*

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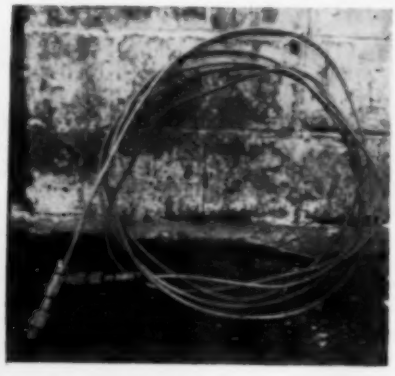
OPERATING IDEAS

Pusher Tool Prevents Damage To Bearing Housing

ADEQUATE TOOLS are a prerequisite for proper and economical maintenance and this often means that the mine shop must devise and make special tools for specific purposes. An example is the special pusher tool made in the shop of the Ethel Chilton Mines, Inc., Ethel, W. Va., shown at right and below.

The motor under overhaul is from a Joy 8BU loader. To remove the armature, it is necessary to take off the pinion-end bearing housing. Formerly this was done by using chisels, wedges, etc., which often damaged the machined fit and sometimes warped or broke the housing.

A special plate with threaded hole and pusher screw was made to attach to the pinion end of the frame. The screw pushes against the end of the armature shaft and forces the whole armature and the rear housing out far enough so a commercial-type puller can be attached to the pinion end housing to pull it off the shaft.



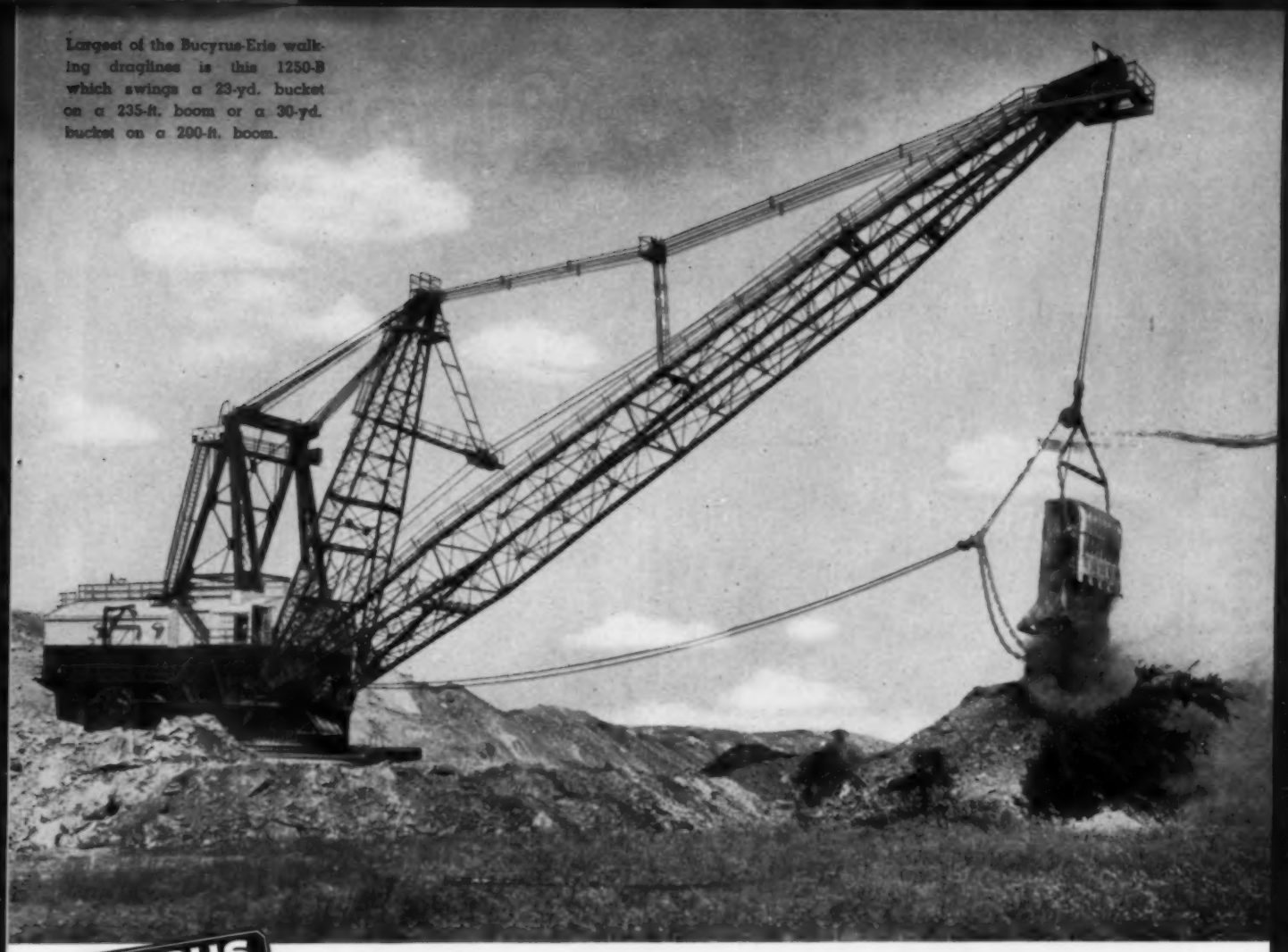
How to Repair Air Leaks Quickly

DELAYS from repairing leaks that develop occasionally in the main-line piping of the air-shooting system have been minimized by having ready a 25-ft length of high-pressure copper tubing with fittings at each end adapting to the steel line, as shown above.

Because the 21-ft sections of steel pipe are not exactly the same length, it is a time-consuming job to match the length and install a new piece when a leak occurs. However, the 25-ft length of copper can be inserted in a short time, thus restoring service. The copper can be taken out and steel installed when the mine is not running.

Electrolytic corrosion has been the cause of most of the air leaks. This is being remedied by adequate bonding and proper grounding at Ethel Chilton.

COAL AGE will publish descriptions of your tried-and-tested "Operating Ideas" at our regular rates. Write a description of your device or idea, include a picture or freehand sketch, and send to The Editor, Coal Age, 330 West 42d St., New York 36, N. Y.



Largest of the Bucyrus-Erie walking draglines is this 1250-B which swings a 23-yd. bucket on a 235-ft. boom or a 30-yd. bucket on a 200-ft. boom.

BUCYRUS ERIE ... *Maker of the World's Largest Selection of*

WALKING DRAGLINES

For efficient, large-scale excavation, you will find a Bucyrus-Erie walking dragline to match your job. There are ten models, from the readily dismantled and reassembled 180-W to the big 1250-B — the largest selection of walking draglines in the world.

Whatever size you choose, you are assured of the same dependable performance that has been characteristic of Bucyrus-Erie walking draglines for years. They have front end design that combines great strength with light weight; the exclusive Bucyrus-Erie walking action with simplicity of design, cushioned action and smooth, fast moveups; and Ward Leonard variable voltage control on all electric powered machines — plus many other features which have made them famous the world over.

Whenever a job involves huge yardages, a Bucyrus-Erie walking dragline — in a size to fit your needs — is a dependable way to economical output.

47L55C

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CLEVELAND ROCK DRILL DIVISION
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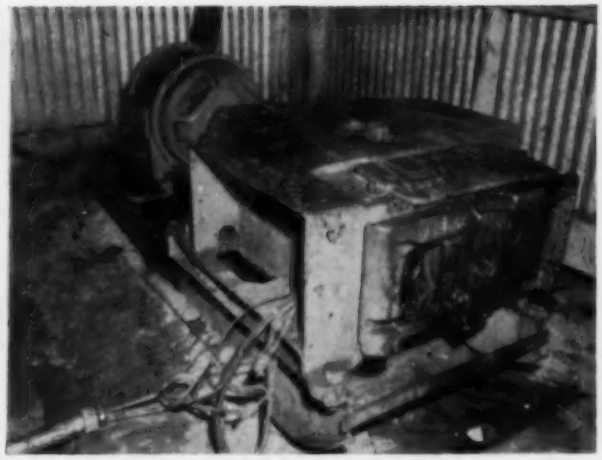
RD-72

Inexpensive Change Improves Loaders

TO OVERCOME a difficulty with the loading machines, a change was made in the method of holding in place the bushings that support the shaft on which the head is hinged. On these 14-BU7AE loaders, the bushing set screw does not hold because the bushing is case hardened and the set screw cannot bite into the surface. When the bushings came loose they sometimes worked out and sheared the large cotter key securing the shaft. A solution was worked out at Ethel Chilton.

The remedy developed by W. S. Massengill, chief electrician, is to burn a hole through the hardened bushing with a cutting torch at the point the set screw marks, then replace the set screw with a cap screw of proper length to extend well into the hole in the bushing.

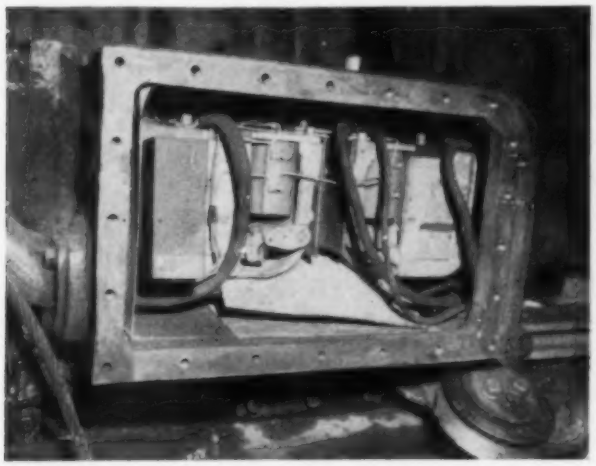


Shortwall Motor Supplies DC for Shop Testing

THE MOTOR of a Goodman 12AA shortwall cutting machine serves as a generator for testing loaders, mining machines, shuttle cars and other DC equipment overhauled in the central shop of the Lorado Coal Mining Co., Lorado, Logan County, W. Va. The shop is several miles from the nearest DC mine power.

The drive is a 30-hp 1,745-rpm direct-coupled AC motor. The Goodman armature was specially banded and balanced to withstand the speed. With the shunt field rheostat cut out, the DC voltage will rise to 325.

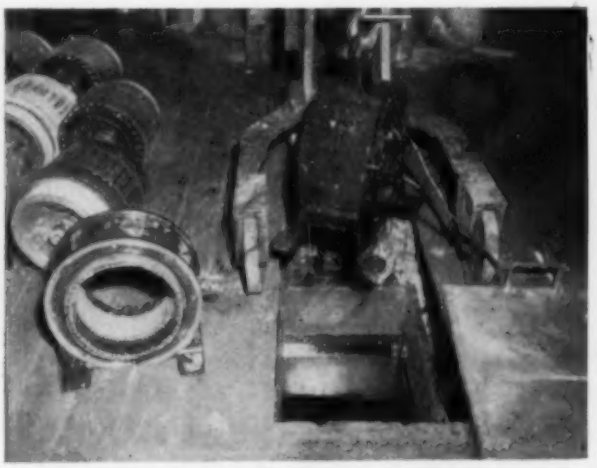
Another "Operating Idea" on p 75



Revised Controller Withstands Heavier Duty

TO REDUCE maintenance, the three original current-acceleration contactors of Joy 7B shortwall cutters are being replaced by two heavier time contactors. Hard cutting and fast feed appears to overload the original contactors. This change is one of several that W. S. Massengill, chief electrician, has made in a campaign to eliminate recurring troubles at Ethel Chilton mining properties, Ethel, W. Va.

The new contactors are 500-amp single-pole units used in Joy Magnetax controls. The time-delay relay for closing of the second contactor is secured by installing a Type ND-11-G Agastat relay.



Revised Dipping Practice Improves Motor Performance

NEARLY 2 YR OF EXPERIENCE in dipping motor frames with the field coils assembled has indicated a marked reduction in motor difficulties at mines of the Lorado Coal Mining Co., Lorado, Logan County, W. Va. The motors are dipped in No. 2A120 clear insulating baking varnish purchased from the National Coil Co.

The major reason for the after-dipping is to prevent oil and moisture from seeping in between the coils and frame and between the coils and pole pieces. The DC motor field frame shown in the photograph, which was taken in the central shop at Lorado, is a Westinghouse SK63 unit rated at 15 hp.

Lagging Public Construction — A Spreading National Blight

The most recent editorial in this series dealt with the plans of American industry for expanding and modernizing its plant and equipment over the next four years. These plans call for the expenditure of $113 billion over that period. There is a good prospect that the money to carry them out will be available. If the plans are carried out, manufacturing capacity at the end of 1958 will be double that which existed at the end of World War II. And this industrial plant will be modernized.

In sharp contrast to this picture is the condition of our *public* plant and equipment — the roads, schools, water supply, health and sanitation facilities upon which industry, as well as the average family, depends. **According to a recent estimate by the Twentieth Century Fund, the people of the United States must spend almost $100 billion on new public works projects during the next five years merely to meet the minimum needs of our growing economy.**

Other estimates by the President's Council of Economic Advisers, by state agencies and by private construction economists all show the same condition: a staggering need for public works. Yet no steps have been taken that even offer a promise of closing the gap between the public facilities we are building and the greater facilities we really need.

How did we come to let our public facilities fall into this sorry state? Here are some of the reasons:

(1) During the years of depression and war, from 1930 to 1945, these facilities were neglected. New construction declined, and even maintenance was cut.

(2) Since the end of World War II, increased construction costs have made it difficult for communities to get the needed construction with the funds budgeted in the past for that purpose.

(3) The great postwar upsurge in population, and the spreading of our population into new areas, has created a huge demand for additional community facilities before the neglect of earlier years could be made up.

Responsibility Divided

Now the need for more public construction has become apparent to everyone, on jammed highways and in over-crowded schools. But, unfortunately, the responsibility for doing something about this situation cannot be so clearly fixed as can the responsibility for maintaining industrial facilities. A business firm must expand its capacity when markets are growing or lose its trade position. It must modernize its plant and equipment or be undersold by more efficient competitors. In the case of public facil-

ities, there is no such competitive incentive. To be sure, a city or state may lose population and industries if its public facilities are inadequate. But such shifts are very slow to take place and difficult to relate to any specific public program, or lack of it.

Moreover, the responsibility for constructing public facilities is divided between state and local governments and federal authorities. Within each of these governmental units there are specialized bureaus or departments with varying responsibilities. This division of responsibility obviously adds an element of difficulty to the development of an adequate program of public construction.

Breaking the Log-Jam

How can this administrative log-jam be broken and the financial difficulties overcome?

One course would be to have the federal government step in with a nation-wide new program of direct spending on public works. That would utilize the resources of the federal treasury for immediate action. But there are weighty objections to such extensive federal participation. One is that federal spending cannot be greatly enlarged without a corresponding increase in the federal control of decisions that normally have been left to local communities. Another objection is based on the fact that so long as we must maintain a large defense establishment, such an addition to federal spending means either higher taxes or a chronically unbalanced budget.

The other course is to rely primarily on local initiative, but with new and more effective federal aid to local governments. Such aid would help speed up planning and construction, and contribute toward a solution of the most burdensome financing problems, but in amounts sufficiently limited to require that most of the capital be raised locally.

No Single Formula

No one formula can be applied to make such aid effective. The raising of funds for new schools, for example, involves problems very different from those of financing highways, or water-works, or hospitals. But it does seem clear that, in all these fields, the federal grants must be designed to stimulate more local planning and financing than has prevailed in the past. Among the new ideas that may offer such incentives are federal grants for planning and initial costs and federal guarantees of local bond issues. Such aids have been remarkably effective in the fields of slum clearance and public housing.

While the federal government clearly has a role to play, we cannot afford to postpone inauguration of an adequate public construction program while we seek a formula to apportion governmental participation that would be generally accepted as ideal. Every year about 2½ million more Americans are putting increasing pressure on a public plant already dilapidated and inadequate. The result is an increasing menace to comfort, health, education and safety. It is also an increasing menace to the effective performance of American industry.

The appropriate public response to this situation is a driving public determination to eliminate this increasingly dangerous lag in public construction. At this juncture, the development of such a determination is basic. Nothing stands in the way of an adequate program of public construction that a determined electorate cannot remove.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

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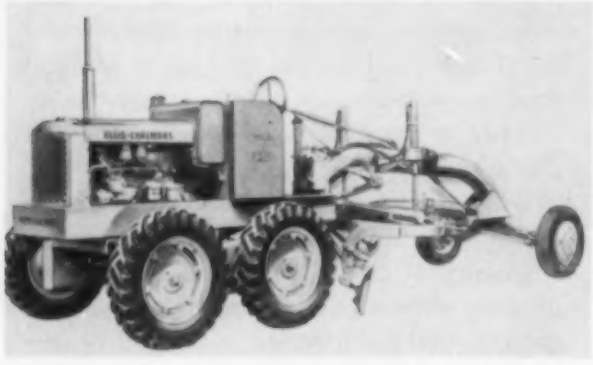
COAL AGE

EQUIPMENT NEWS

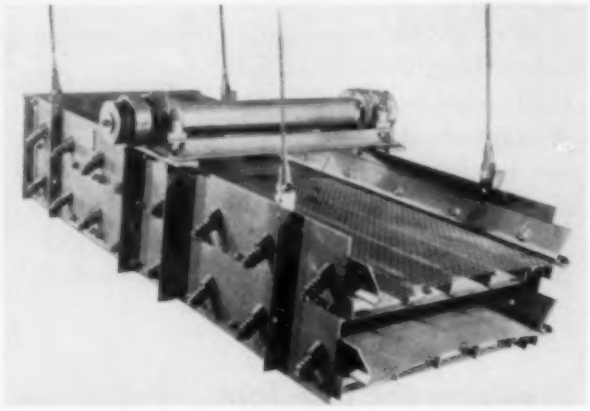


New Motor Grader Features Diesel Power

Allis-Chalmers Model D diesel motor grader with a new Allis-Chalmers 6-cyl valve-in-head diesel engine rated at 50 brake max. hp at 1,625 rpm, features direct electric starting on diesel fuel from a 12-v starting system. Incorporated in the new engine are replaceable wet-type cylinder liners; by-pass cooling system with high capacity water pump; pressure lubrication; aluminum alloy pistons; simple, easily serviced fuel injection system; and four filters to assure clean fuel. Weight of the Model D is 9,350 lb with 2,760 lb on the front wheels, and 6,590 lb on the rear. Blade pressure is 4,900 lbs. Speeds with 7.50x20 tires range from 2.6 mph in first gear to 25.2 mph in fourth gear. Full details from Tractor Div., Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

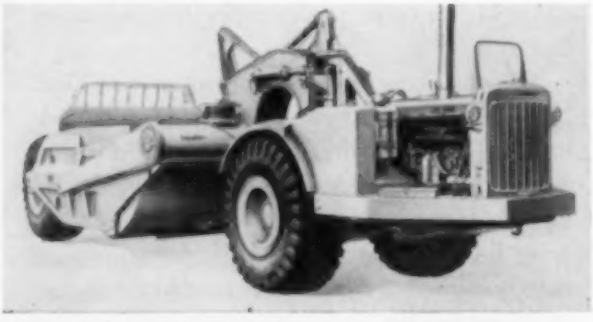
Tracklaying Shuttle Car Redesigned

Newly-designed General Electric permissible shuttle car exhibits major improvements such as one-piece side frames, one-piece improved track carriage frame, simplified controller construction with rotary switches, new type conveyor motor, and splined drive sprockets. Heavy formed-steel guards for the two conveyor motors on the front of the car help prevent damage to the conveyor motors. The crawler track system, the distinguishing feature of G-E shuttle cars, is designed to give the car higher maneuverability, easy control, and allow haulage capacity. Advantages of the new 8-ton shuttle car, the designer says, include: a simple two-lever control for easy maneuverability; a caterpillar track system giving a short-turning radius of 14 feet; two 20-hp traction motors for extra power when operating up grades and on bad bottoms; two 5-hp pump motors for the hydraulic system. All motors are explosion proof. Basic height of the car is 43 inches, plus optional 6- or 12-in sideboards. The redesigned shuttle car may be operated at 250 or 500 v.



New Vibrator for Coal Preparation

A new "Aero-Vibe" screen, Model AVS, utilizing a simplified two-bearing design with counterweight wheels and sturdy bolted construction is announced by Allis-Chalmers Mfg. Co. Built to handle coal up to 6 in, the screen can make separations of from 1½ in to 35 mesh. It can also be used for thickening, dewatering and stream pollution reduction. Self-contained, saddle-mounted mechanism can be conveniently inspected, lubricated, or removed. The sturdy screen body is constructed of rolled steel with heavy channel cross members and rigid diagonal braces. Longitudinal members are replaceable with lock nuts used throughout for easy replacement. The "Aero-Vibe" is available in suspended or floor-mounted models frame mounted for portability, semi or totally enclosed, with one, two or three decks in sizes 3x6 to 4x10 ft. Construction features of the new screen are described in a 12-p bulletin which offers pointers on how to select a vibrating screen and carries a table of sizes and dimensions for the unit. Copies of Bulletin 07B6099A, available from Allis-Chalmers Mfg. Co., 968 S. 70th St., Milwaukee, Wis.



More Power in Tractor, Scraper Team

Caterpillar Tractor Co., Peoria, Ill., announces two new additions to its rubber tired-tractor line, DW21 (Series C) and DW20 (Series E), both featuring more horsepower and major design changes over current models. Under the hoods is a powerful new diesel engine, rated at 300 hp at 1,800 rpm. Piston displacement is 805 cubic inches. The six cylinder, 5¼x6½-in diesel engine is turbocharged for greater horsepower. Driven by the engine's exhaust, the turbocharger utilizes energy

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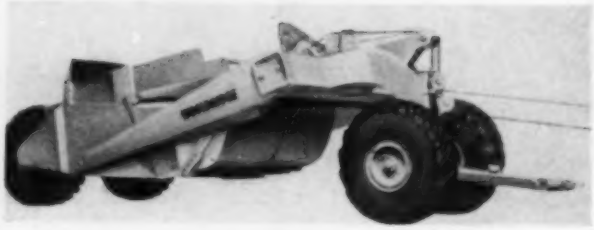
that otherwise would be lost. Wide base tires are standard equipment (in rock-type tread) on the DW21 and DW20. Customer may have choice of either direct electric starting or gasoline starting. Speeds for the DW20 range from a low of 2.8 mph to a high of 32.1 mph; on the DW21 from a low of 2.3 mph to a high of 20.5 mph. Caterpillar also has designed two new matching scraper units—the No. 456 Scraper for the DW20 and the No. 470 Scraper for the DW21. These scrapers feature a new concept in scraper engineering—the exclusive Caterpillar "low-bowl" design. Wider and longer bowls increase the capacity to 18 yards struck and 25 yards heaped. The new "low-bowl" design is shallower, permitting faster loading due to less lifting effort involved. The higher a load must be hoisted by forcing material in from the bottom, the more horsepower is required. The new No. 456 and No. 470 Scrapers with their "lowbowl" design cut down on this internal resistance to loading. The same wide-base tires that appear on the new tractors are standard on the "lowbowl" scrapers to give better flotation.

Largest Scrapers Offer Wide-Base Tires

Wooldridge Scrapers with capacities up to 41 cu yd, believed to be the largest standard models ver available, and the first to offer the new wide base tires for greater flotation and



carrying capacity, have been announced by Wooldridge Mfg. Div., Continental Copper & Steel Industries, Inc., of Sunnyvale, Cal. The introduction of three new tractor-drawn scrapers is also said to complete the broadest capacity range of models available. Of open bowl, cable operated type, the new units are engineered to utilize the full horsepower available not only with the largest tractors now built, but also with larger models announced for the future. Model OS-300 has capacities of 41.0 cu yd heaped, and 34.0 cu yd struck; OS-260 is rated at 35.0 cu yd heaped, 30.0 struck, with side extension, or 32.5 heaped and 26.0 struck without extensions, and Model OS-200 with side extensions carries 28.0 cu yd heaped and 24.0 struck.

DUST COLLECTOR USES GLASS SPHERES IN FILTERING

The National "Hydro-Filter," a wet-type dust collector operating on the filtration principle is offered by National Dust Collector Corp., Machinery Hall Bldg., Chicago 6, Ill. The new unit is basically an "air scrubber" as dust is brought into contact with water under such conditions as to cause the dust to transfer to the liquid stream by impingement on wetted glass spheres or entrapment within bubbles, water droplets or mist. Efficiencies of up to 99.7% on products such as western bentonite, 3-4 micron carbonyl iron and optical dust have been reported. Advantages and outstanding features cited by the maker are: Self-cleaning (a constant flow of water washes collected dust into an integral sludge tank); low maintenance (no baffles or other intricate, difficult-to-clean parts within collection area); low water requirements (¼ gpm make-up water is required per 1000 cfm average); Bulletin describing Hydro-Filter applications, operating principle and specifications on 14 models ranging in capacities from 2,500 to 25,000 cfm from maker.

SILICON RECTIFIER FEATURES HIGH EFFICIENCY

A Celab rectifier made from West Africa silicon tops 99% efficiency, and stays there permanently, the maker says. The rectifier for 60 kw above, can be placed in a brief case, the remainder of the space being used for transformers, breakers, plugs, meters and other auxiliaries. Note: All our transformers are now also, being one piece wound oriented steel. The unit has no moving parts, fans, blowers. There is nothing to replace, wear out or burn out. Power factor tops 98% at full load, and the unit features inherently high regulation—better than 4%. The unit shown is our standard 60-kw Celab silicon rectifier. It is the same size as a 5 kw selenium unit, and can be supplied in either a vertical as shown or in a low head skid mounted unit only 24-in high, ready to use. They are unaffected by heat up to 450 F, moisture, dust, corrosive fumes, or vibration and shock, the maker claims. Full details from Clark Electronic Laboratories, Box 165, Palm Springs, Calif.

DEEP-TREAD TRUCK TIRES

More rubber on over-the-road tires is offered by The General Tire & Rubber Co., Okron, Ohio, in its new "Super Expressway" highway tire, the company says. Tread on the new casing runs 12 to 15% wider and deeper at approximately 7½% higher cost. With a tread design similar to the Expressway, the "Super" is available in both standard carcass construction and Nygen. More and longer side vents are built into the shoulders of the tire for better heat radiation and cool running.

7½-KVAR LOW-VOLTAGE POWER CAPACITOR

A new 7½-kvar, single phase, 240-v power capacitor (Type FPS) for secondary distribution circuits is now available from Westinghouse Electric Corp. in addition to the 3- and 5-kvar power capacitors previously announced. Improved design provides for mounting the power capacitor with terminals either up or down for direct pole or cross-arm mounting. Approximate weight of the new 7½ kvar capacitor is 37 lb. Its length from the bottom of the casing to the tip of the terminal is 26 $\frac{9}{16}$ in, and its diameter is 5½ in. Weights of the 5- and 3-kvar capacitors are 25 and 16 lb respectively. Details from Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

NEW COATING LASTS LONGER

"Storm King" aluminum roof coating, made by the Warren Refining & Chemical Co., is a combination of aluminum paste and asphalt said to have longer life and greater reflective properties than straight aluminum paint. Data from Warren Refining & Chemical Co., 5151 Dennison Ave., Cleveland 2, Ohio.

BIG TRACTOR FOR TOUGH JOBS

Increased power, durability, operating ease and comfort and smart appearance are outstanding features of the International TD-18A diesel crawler tractor. Power in the new model has been increased to 103 db-hp, a boost that puts the TD-18A in the big tractor class and enables it to handle tougher jobs, and the power train is designed accordingly. The TD-18A has six forward and two reverse transmission speeds, ranging from 1.6 up to 5.5 mph. Track frames on the new model have been made 300% stronger,

"Reduced Oil Consumption 85% with Cities Service C-300 Motor Oil!"

Here's the story in the words of David D. Vickrey, Superintendent of Chenoa Stone Company:

"About two years ago, we switched from another nationally prominent brand oil to Cities Service C-300 Series Motor Oil. The results have been amazing.

"C-300's detergent action completely eliminated a bothersome sludge problem. On our first three oil changes with it, we removed 5 gallons of sludge from each of our 200 horsepower diesels. Since then, these diesels have remained clean, and today, when we open the crankcase, we can even see the paint.

"We also are using far less oil between changes. In fact Cities Service C-300 actually cut make-up oil from 5 to 6 gallons every 150 hours to less than one gallon every 150 hours!

"In addition to C-300 oil, we use Cities Service Lubricants for every requirement... Diesel Fuel, Gasolenes, Trojan M Grease and hydraulic fluid. We have been completely satisfied with every product.

"Cities Service has given us top-notch service, the best we've ever had. We are better supplied than ever and have learned to rely on Cities Service dependability."

There is nothing Cities Service could possibly add to Mr. Vickrey's statement, except a reminder to contact your local Cities Service representative in order that you may enjoy similar results in *your* operation. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

with machined surfaces to assure permanent fit and positive, permanent track alignment, the maker says. The crawler has a full-adjustable, truck-type foam-rubber seat 3½ in deep and is 18⅞ in wider than the seat in the old model. The dash is streamlined, and the new rectangular air cleaner has been moved under the hood to give the operator unobstructed visibility. Positive self-energizing brakes are designed to respond instantly to the merest touch of the foot, locking the track securely. The tractor is 158¼ in long and 96 in wide with 22-in shoes. Full details from Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

SIX-IN-ROW RIPPER HEAD

Bowdil ripper head utilizes 6 renewable, independently adjusted cutterbars, making it possible to retain equal tension on all 6 chains irregardless of their length or age, within liberal limits. Special hard-surfaced wearing shoes in heads of cutterbars reduce maintenance on roller and bearings, and all six chains are similar in kerf and lacing arrangement for interchangeability. Chains may be run with or without renewable liners in the cutterbars as desired. Included in the assembly is an improved head drive shaft and sprocket assembly, which makes it possible to renew a sprocket in minutes without removing the shaft. The rear of the ripper head frame is arranged with circular shock seats for the drive assembly which normally clears the drive assembly approximately 1/16 in to guard against extreme flexing of the drive shaft at overloads. This avoids breaking the shaft, according to the maker, Bowdil Co., Canton 7, Ohio.

NEW CABLE-SPLICING TAPES

A new line of cable splicing tapes for use with standard steam or electric vulcanizers has been developed by The Okonite Co., Passaic, N. J., including rubber insulation, rubber sheath and colored neoprene sheath tapes that are simple to apply and vulcanize easily into void-free splices equal mechanically and electrically to the cable itself. Designed particularly for splicing mine trailing cables and all portable constructions, Okonite vulcanizer tapes, supplied in standard 1-in widths, may also be used where the immediate, added protection of a vulcanized splice is desired in permanent or fixed cable installations. The rubber insulation tape is grey and the rubber sheath tape is black. The neoprene sheath tape is available in black, red, yellow and green for simplified identification and color-coding. All colors provide the lasting protection of an abrasion and moisture-resistant neoprene sheath that can be permanently bonded to the neoprene sheath of any cable. Full details from the company.

COLOR-CODED, TRANSPARENT HOLDERS PROTECT CONTENTS

Important data that requires routing, multiple-handling, and quick-reference filing can now be protected from grease, dirt, water and smudgy fingers, yet remain completely visible, quickly identified and easily handled, when enclosed in a color-coded, transparent acetate route-and-file holder. Each holder consists of a heat-folded sheet of first-grade, scratch-free, flame-resistant acetate, closed at one edge with the colored tape. The remaining two edges are open for easy insertion or removal of the routed data at each stop. The colored tape provides fast identification in current or permanent files. "Dub'l-Vue" route-and-file holders are offered in standard 8½x11-in size, .005 acetate thickness, with taped edges of blue, red, green, yellow or black. Additional information from Baw Co., 9704 Frankstown Rd., Pittsburgh 35, Pa.

BIGGER, AIR-COOLED PACKAGED COMPRESSOR

A 125-hp electric-driven air compressor has been added to the Ingersoll-Rand line of air-cooled 2-stage Type 40 stationary compressors. The new unit is expected to fulfill the need of contractors and industries for a lightweight compressor that can easily be moved from job to job. New features are: single-core, horizontal-flow intercooler, new shrouding, force-feed lubrication, full free-air unloading and a new version of the famous Ingersoll-Rand Channel Valve. These and other features make the 125-M compressor a neat, accessible, compact and efficient package that is easily adapted to either permanent or temporary jobs, the maker says. It can be installed with a minimum of foundation, time and labor. Either constant-speed control or dual control can be furnished. Dual control is available with either automatic or manual selection, permitting operation at constant-speed or automatic start-and-stop, whichever is deemed more economical. This unit adds a 125 hp unit to the Type 40 line which already includes sizes of 25, 40, 50, 75 and 100 hp. Form 3188 from Ingersoll-Rand branch offices, or Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

LARGE TRACTOR SHOVEL

The third and largest of the completely new 4-wheel-drive tractor-shovels to be added to the "Payloader" line is announced by The Frank G. Hough Co., Libertyville, Ill. The newest unit, Model HO, has a capacity of 2 cu yd, and is similar in styling to the 1 and 1½ cu yd models HU and HH, recently introduced. The outstanding features of "pry-out" bucket action; 40 deg of "breakout" at ground level and new standards of safety and stability are common to all three new models. In addition, the new HO Payloader features a newly developed complete "power-shift" transmission, eliminating the clutch pedal and making it unnecessary to stop in shifting at all speeds, forward or reverse. Other features include sealed, pressure-controlled hydraulic system; 12-v battery system on the gas-powered model with battery box and hydraulic oil reservoir mounted behind driver's seat for easy accessibility; torque converter; double-acting hydraulic rams with chrome-plated piston rods; vacuum-boosted, 4-wheel hydraulic brakes and power steering. A load-shock accumulator device is optional. Full details from manufacturer.

HEAVY-DUTY POWER TAKEOFF

Twin Disc Clutch Co. has developed an all-new heavy-duty Friction Power Takeoff, designed and engineered especially to meet the extra requirements of engines in the 350- to 375-hp class, operating in the 1,800-rpm range. Extremely compact for its capacity, the new Twin Disc power takeoff accommodates an SAE No. 0 flywheel. With triple drive-plate construction, it assures ample friction surfaces to withstand excessive heat. And with the solid driving-plate design, the new PTO can effectively handle the

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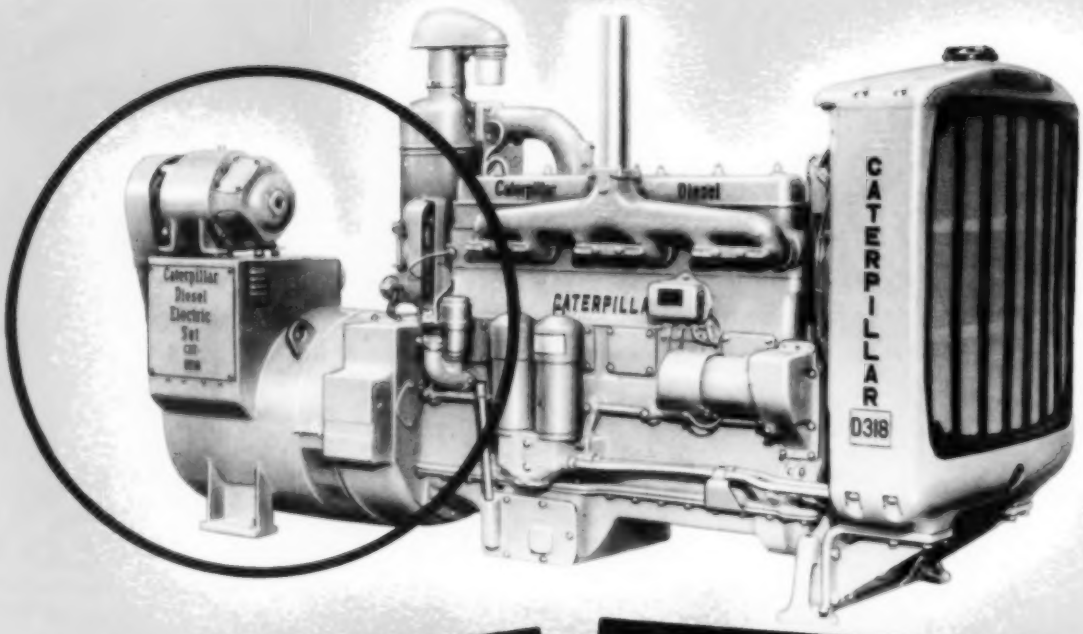
CATERPILLAR

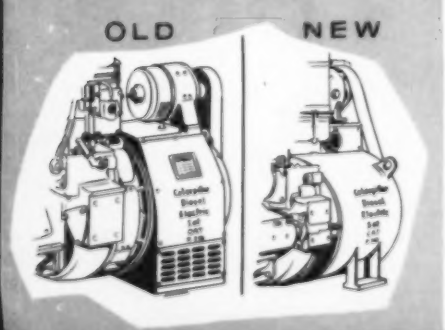


Nothing like it for simple operation, flexible application, compact power, rugged construction, long life and ease of maintenance.

Heart of the new line of Cat Diesel Electric Sets, providing in one package the best features of self-regulated and externally-regulated generator plants—you get more for your money.

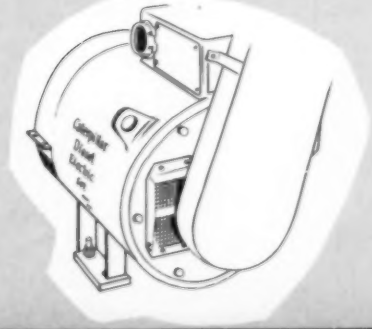
Easily paralleled with other generators now in use.

There is a big difference in size between the old and new Caterpillar Generators.



New insulation permits more compact design—exaggerated comparison in illustration below.

New design saves space. Leads can be taken from side, back or top without affecting machine width.



GENERATOR

Here is a new concept in generators – an advance that stems both from Caterpillar research and practical experience in the field of electric power.

Combining latest developments in design, materials and production, it brings to Caterpillar's new line of Diesel Electric Sets the efficiency of the externally-regulated set in a self-regulated set–you get more for your money.

These rugged power packages provide you with many new advantages. Here are a few of many features that add up to a new standard of efficient, economical performance:

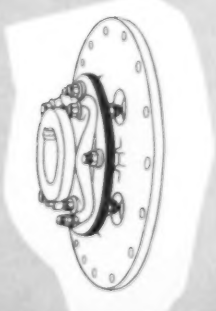
- **Close regulation of voltage—no load to full load.**
- **Easy to start—require no operating adjustments. Anyone can run them.**
- **Extremely compact—big electrically, packing more power in smaller space than old style units.**
- **Easily paralleled with other generators now in use.**
- **Like all Caterpillar-built equipment—100% backed by Caterpillar.**
- **Sold and serviced by one reliable source—your nearby Caterpillar Dealer.**

Whatever your power requirements, it will pay you to look into the new Cat Diesel Electric Sets with their advance-design generators. Get the full facts about them from your Caterpillar Dealer.

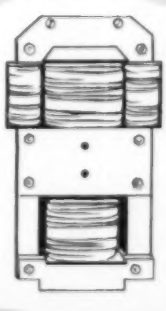
MAJOR ADVANTAGES OF THE NEW CAT GENERATORS

1. **MATCHED TO ENGINE PERFORMANCE.** Each Cat Generator is designed and built to exactly match the Cat Engine powering it, assuring maximum efficiency in a simple, complete package.
2. **SELF-REGULATING, WITH CLOSE VOLTAGE REGULATION.** Designed to meet the needs of applications now served by self-regulated or externally-regulated generators, this new generator provides steady voltage from no load to full load.
3. **ADJUSTABLE FOR SPECIAL CONDITIONS.** During initial installation, the terminal voltage and voltage "droop" can be adjusted to meet the special conditions of the application. After that, the adjustments are locked and no further adjustments are necessary.
4. **EASY TO INSTALL.** No complicated switchgear or external voltage regulators are needed.
5. **VERSATILE IN APPLICATION.** Easily paralleled with other generators now in use.
6. **SMALL AND COMPACT.** Occupy less space than other generators. A reduction in frame size, close coupling, top-mounted exciter results in a shorter over-all package length.
7. **BIG ELECTRICALLY.** Motor starting ability — capacity to handle the surge of heavy loads.
8. **EASY TO MAINTAIN.** Heavy-duty, single-bearing, close-coupled construction. The single bearing is easily accessible and is lubricated from an oil reservoir that requires filling only once a year.
9. **RUGGEDLY CONSTRUCTED.** Heavy-duty, laminated pole rotor for improved operation and increased rotor life.
10. **DESIGNED FOR LONG LIFE.** Built to match the long life of the Caterpillar Engine powering them.

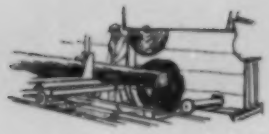
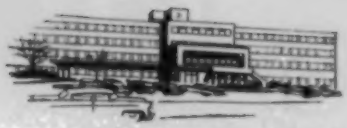
Disc-type coupling and single-bearing design save space. Single bearing is easily accessible.



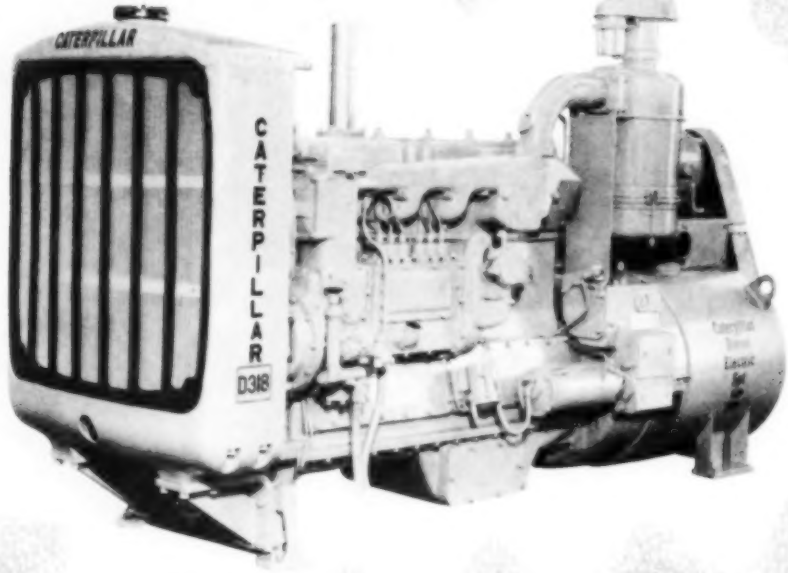
The "regulator" of the Caterpillar Generator. No moving parts — compact — reliable.



The control panel—adjustments locked at installation. No further attention required.

The new CAT* Generator



. . . another example of Caterpillar leadership in action

In 1939, Caterpillar introduced the first Cat self-regulated Electric Set.

At the time, this was a new concept in diesel-electric power.

Like most new developments, it had to win acceptance against "old, hidebound, traditional prejudices and practices."

It won acceptance — quickly and with outstanding success!

Just look at the record: since 1939, thousands of Cat Electric Sets have delivered long, reliable, economical service in widely different applications in every corner of the world. Sets with many thousands of hours of profitable operation are not uncommon. Many with more than 100,000 hours on their meters are still in use and going strong.

No matter how old they grow, not a single one ever becomes a "parts orphan." Like every Caterpillar-built machine, genuine Cat parts will be available as long as you have a need for them.

Now Caterpillar introduces another new concept in diesel-electric power—a new and better generator, heart of the new line of Caterpillar Diesel Electric Sets.

Like that 1939 "new concept of diesel-electric power," this is also backed 100%.

New design, new materials and new production techniques have made it possible for you to get more for your money in the new power packages.

See your Caterpillar Dealer about the new line today!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Cat and Caterpillar are Registered Trademarks of Caterpillar Tractor Co., U. S. A.

NEW HEAVY-DUTY ELECTRIC SETS

MAIL TODAY!

CATERPILLAR TRACTOR CO., Peoria, Illinois, U. S. A.

I'd like more information on the new Cat Generator.

Name _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

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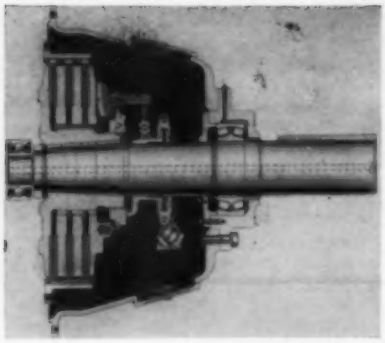
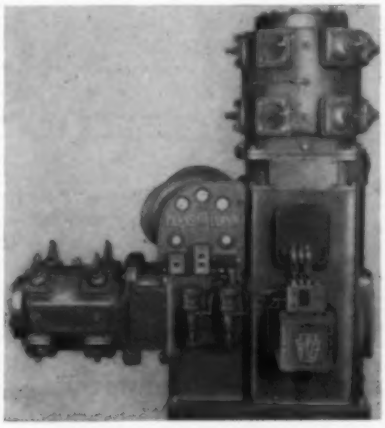


stress of higher rpm. The pilot bearing of the power takeoff is composed of a single row of balls, operating in bearing races of double-row width providing improved accommodation of minor misalignment inherent with installations of this nature. Another feature is the use of spherical bearings. With its inherent ability to permit angularity, the spherical bearing is more resistant to overload or destructive forces from heavy side loads. This new Twin Disc SP-318 friction power takeoff is the forerunner of a complete line of power takeoffs but at present, only the SP-314—a smaller model of the same new design—for engines in the 225-hp range operating at 2,200 rpm, is available. More complete information from Twin Disc Clutch Co., Racine, Wis.



ANGLE-TYPE COMPRESSOR

Pennsylvania Pump & Compressor Co., Easton, Pa., announces two-stage, heavy-duty, water-cooled, angle-type compressor, in capacity range from 797 to 974 cfm. Outstanding features include compactness, portability and flexibility of installation by virtue of reversible intake and discharge openings. Intercooler tubes are replaceable. Full-pressure lubrication through rifle-drilled passages to all internal bearing surfaces is featured, and main bearings are of the spherical roller-type. Bulletin 602 available from maker.

Be sure to look through the list of free trade literature, beginning on p 102. You're almost sure to find a bulletin or data sheet you need in your equipment-coverage library.

EASY-TO-USE HOSE CLAMP AFFIXED IN THREE SECONDS

A new type general-purpose hose clamp can be fixed in place in 3 sec with an ordinary pincers. Lasting and positive clamping action is assured under extreme internal hose pressure, hose movement and tough usage, the maker states. It can be used with motors, pumps, compressors, and in the manufacture of equipment for coal and ore mining, quarries, tunnel construction and so on. Pittsburgh Testing Laboratory hydrostatic pressure tests on ⅞-in O. D. wire-braided hose, using typical production clamps of this new type, have shown no slippage or loss of clamping action at hose burst pressures ranging from 12,300 to 12,800 psi. The clamps are available in 20 sizes ranging from ¼-in I. D. to 2⅝-in I. D., larger sizes on special request. Additional information from Circle Clamp Corp., 39 Broadway, New York 6. N. Y.

NEWLY-DESIGNED MOTORS IN 1-10 HP RATINGS

Wagner Electric Corporation, St. Louis, Mo., announces newly designed standard and explosion-proof totally-enclosed motors featuring corrosion-resistant cast iron frames, improved winding insulation and heavy duty ball bearings. Grease fittings are provided at top and bottom of bearing housing to permit convenient lubrication and removal of old grease. A running shaft seal on each end of fan-cooled motors and on the drive end of non-ventilated motors effectively prevents the entrance of contaminants which might injure the bearings. Pressure-cast aluminum squirrel-cage rotors are dynamically balanced to assure smooth, quiet operation. Current production includes ratings 1 through 10 hp, 4-pole, 60-cycle, in rerated NEMA frames 182 through 256U. Frames 213 and larger are cast with heavy ribs for efficient cooling. A smooth-running, external fan of bronze or malleable iron effectively cools the motor and prevents dust from collecting on the frame. Bulletin MU-203 available from Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.

NEW STRAIGHT-WALL PRE-FAB INCREASES WAREHOUSE SPACE

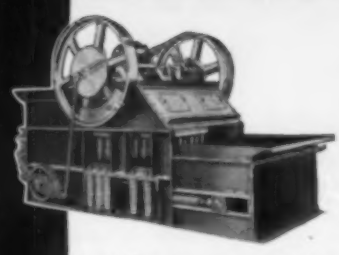
Development of a new "straight-wall" pre-fabricated steel building, featuring inexpensive, trussless construction, and designed to meet storage and warehousing needs in the mining field, is announced by Wonder Building Corp. of America, 30 N. LaSalle St., Chicago 2. The new building can be erected in a matter of hours by as few as two workers using simple nut and bolt fasteners. Erection costs are said to average $.30 per sq ft. Purchase costs are $1.25 per sq ft, for a building complete with ends, doors, and all necessary hardware. Wonder Buildings require no foundation other than a simple concrete slab. This cost is approximately one-third less than conventional brick, mason or frame construction, the maker says. Sizes of the new straight-wall Wonder Building range in width from 30 to 50 feet, and from 12 to 18 feet in height. The length of individual buildings can be tailored to needs.

LUBRICATION SIMPLIFIED

A simple positive high-pressure centralized system for controlled lubrication of bearings while a machine is either operating or idle has been announced by Lincoln Engineering Co., 5729 Natural Bridge Ave., St. Louis 20, Mo. The manually-operated pumping unit incorporates a 15-lb capacity reservoir for grease or oil. A few strokes of the pump handle forces lubricant under 2,500 psi

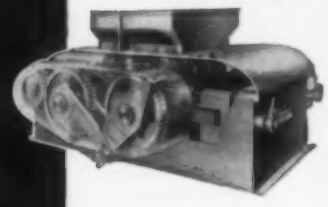
America's most complete line of CRUSHING EQUIPMENT

AVAILABLE
FROM STOCK
AND ON SHORT DELIVERY



McNally Norton Vertical Pick Breaker

50% less fines when reducing lump to egg and stove sizes.

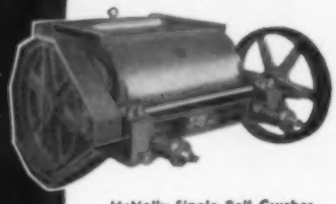


McNally Double Roll Gearmatic R. O. M. Breaker

Built in tonnage ranges from 750 tph to 1400 tph. Full floating Gearmatic drive.

McNally Gearmatic Stoker Coal Crusher

This unit offers three prime advantages:
High volume production, plus accurate sizing, plus low percentage of fines.



McNally Single Roll Crusher

Universal application. 20", 24" and 36" dia. rolls.

For immediate action on complete information write, wire or call . . .

Mc

★ Pittsburg, Kansas ★
★ Wellston, Ohio ★

pressure through a single-line circuit of injectors, or adjustable hydraulic force-feed measuring valves, one for each bearing, which in turn deliver a measured quantity of oil or grease every time the system is cycled. Completion of the lubrication cycle is shown by an indicator device, and release of pump handle by operator automatically vents and recharges system. The system comes complete with all necessary accessories and no special tools or engineering knowledge is required to install it, the company reports. Bulletin 807 with details from Lincoln Engineering.

NEW ½-CU YD SHOVEL

Smallest unit in the Lima line, the new ½-cu yd Lima Type 24 "Jobmaster," is available with crawler or rubber mountings and is readily convertible to shovel, crane, dragline or pull-shovel application. On a truck or wagon mount the Jobmaster crane has a lifting capacity of 15 tons at 10-ft radius; as a crawler crane, 13 tons at 10-ft radius. Designed for mobility, high output, speed and low-cost maintenance, the unit employs machine-cut gears, large-diameter brakes and clutches in the hoist, crowd and retract, and swing and propel mechanisms; independent boom hoist with engine-controlled boom lowering; differential tractor-type steering, independent combination chain and cable crowd and retract, internal-external-tooth jaw clutch for quick engagement and minimum backlash in gear train, liberal use of antifriction bearings, heat-treated ground shafting and floating steel-disk-type dirt seals in tread rollers. As a shovel, the diesel- or gasoline-powered Jobmaster has a 16-ft 6-in boom and 13-ft 3-in dipper handle. Data from Baldwin-Lima-Hamilton Corp., Lima, Ohio.

FREE BULLETINS AVAILABLE

AIR COMPRESSOR—New Ingersoll-Rand publication, Form 2302, features the 36-cfm (80 psi) air compressor which weighs only 265 lb. The unit may be carried by two men, pushed in a wheelbarrow or lifted to the back of a small truck for use in applications where a large compressor is not required. From Ingersoll-Rand Co., 11 Broadway, New York 4.

ELECTRICAL EQUIPMENT—New General Electric bulletins on motors, motor controls, adjustable-speed drives and current-limiting fuses are available, as follows:

GEA-6280, a 12-p publication, discusses the new vertical Tri-Clad motor, emphasizing improved maintenance features and simplified lubrication of the dripproof, hollow-shaft, high-thrust motor available in ratings from 7½ to 500 hp for pumping applications.

GEA-6331 features Limitamp high-voltage, current limiting, fused starters for co-ordinated control of squirrel-cage, synchronous, wound-rotor and multi-speed motors. The new starter is designed for easier installation and requires less space.

GEA-6234, an 8-p publication, discusses features and specifications of the new Thy-Mo-Trol general-purpose, full-wave adjustable-speed drive for ¾ to 3 hp applications requiring smooth, stepless adjustable speed on AC power.

GEA-6319, also 8 p, describes current-limiting fuses rated at 250 and 600 v in sizes from 6 to 200 amp for use in fused safety switches, combination starters, small motor circuits and so on, with specifications, dimensions, and curves of fuse characteristics.

Available from General Electric Co., Schenectady 5, N. Y.

STEEL DATA LIST—Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa., offers a 16-p, pocketsize publication list of the company's 85 current technical data sheets and booklets on stainless, electrical, tool and die steels, and other high-alloy specialties.

DIAPHRAGM PUMPS—Bulletin P8-B9 describes operation, construction and capacities of heavy-duty, adjustable-stroke diaphragm pumps in sizes up to 6 in and discharge volumes up to 92 cfm of water for use in handling thickener underflow, metering feed to flotation units or handling filtrate. Denver Equipment Co., Box 5286, Denver 17, Colo.

COAL RECOVERY AUGERS—New 4-p Bulletin M-101 features hydraulic and manual models of McCarthy coal-recovery drills, providing specifications on units employing augers from 16 to 42 in in diameter. Slack-coal and lump-coal cutting heads also are described. Salem Tool Co., S. Ellsworth Ave., Salem, Ohio.

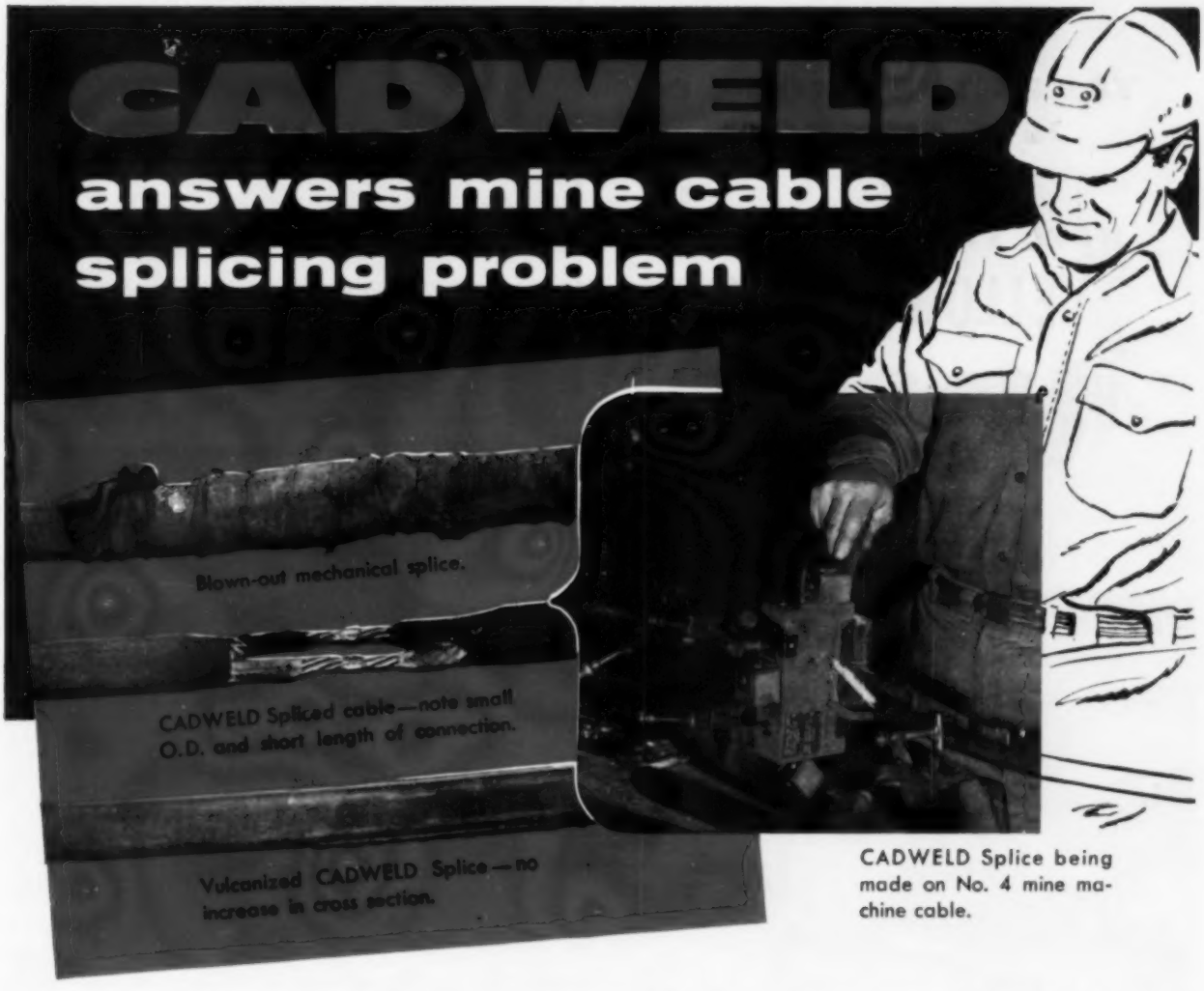
DUST COLLECTOR — Pangborn counter-current, tower-type wet dust collector is the subject of Bulletin 919, which gives full data on this centrifugal unit designed for precipitation of hot, moist, inflammable, abrasive, corrosive or obnoxious dusts. From Pangborn Corp., Hagerstown, Md.

DUMP TRUCK BODIES—Construction features and detailed specifications of Heil LH-11 and H-11 heavy-duty dump bodies are carried in Bulletin BH-55107, available from Heil dealers or from The Heil Co., body and hoist sales div., Milwaukee 1, Wis. Features of bodies are double-acting tailgates, interlaced underbody construction, one-piece corner posts and single steel sheet body sides, among others.

TRUCK SCALES—Form No. 2417a, Toledo Scales Co., Toledo 1, Ohio, discusses the expanded line of "Hi-Weigh" scales, ranging from 60-ft platform sizes down to axle-load scales, emphasizing new features in weighbridge construction and pit design which contribute to higher strength and economy in installation. Also included are helpful suggestions for selecting a motor-truck scale.

PROSPECTING DRILL—Economical, easily-transported Hossfeld drill for prospecting up to 110 ft deep is powered by

CADWELD answers mine cable splicing problem


Blown-out mechanical splice.
CADWELD Spliced cable—note small O.D. and short length of connection.
Vulcanized CADWELD Splice—no increase in cross section.

CADWELD Splice being made on No. 4 mine machine cable.

CADWELD Mine Machine cable splices have the following distinct advantages over mechanical connections.

PHYSICALLY

1. O.D. of the finished CADWELD splice is equal to that of the conductor.
2. Length of splice is short—original cable flexing qualities maintained in reeling operation.
3. O.D. of vulcanized splice equal to new cable.
4. Tensile equal to 95% of original conductor.

ELECTRICALLY

1. Current carrying capacity equal to that of the conductor.
2. Cannot oxidize.
3. A perfect fusion weld.
4. Withstands surge currents, PLUS the equipment allows individual mines to repair their own cable—no waiting—cuts costs 75%.

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2070 E. 61st Place • Cleveland 3, Ohio

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TAKES THE SHOCK OF JETS AND ROCK

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NEW, EXTRA STRENGTH

YELLOW STRAND "POWERSTEEL" WIRE ROPE

"POWERSTEEL" cuts rope replacement costs on shovels and draglines saving time and manpower.

1" Yellow Strand "POWERSTEEL" Wire Rope stretched across the runway at Lambert Field, St. Louis brings the Banshee fighter to a safe, sure stop.

■ You may never have to lasso a 600 MPH jet —but if you have an application requiring an extra margin of strength, it's a cinch for Yellow Strand "POWERSTEEL"!

Made of higher carbon content steel, new "POWERSTEEL" is 15% stronger, assuring longer life. It withstands shock, resists wear. Preformed, with IWRC, "POWERSTEEL" is a heavy-duty, crush-resistant rope designed to give long, dependable service.

See your Broderick & Bascom distributor or write the branch nearest you for information.

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Manufacturers of Wire Rope for 79 Years

655 Edmonds St., Seattle 8, Wash.
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270 North Street, Teterboro, New Jersey
1330 W. Fulton St., Chicago 7, Ill.
2441 Hunter St., Los Angeles 21, Calif.
9350 Market St. Road, Houston 15, Texas

a 5-hp gasoline engine which drives drill stem through simple belt transmission, according to a 4-p descriptive bulletin available from the maker, Hossfeld Mfg. Co., Winona, Minn.

STEEL BUYERS' GUIDE—Bulletin 11-2, from Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill., tells how to combine orders to get lower steel prices, how more accurate cutting reduces fabricating time and how to use steel specifications to advantage in purchasing bars, structural shapes, plates or sheets and strip.

PAN-TYPE CONVEYORS—New booklet by Simplicity Engineering Co., Durand, Mich., describes 32 Series pan-type conveyors, which can be equipped with grizzly decks, side extensions, double carrying surfaces, screen cloth or perforated plate, and explains how the balanced-pan conveyor, using a lighter drive assembly, operates through a system of counterbalances at ends of rocker arms.

FEEDERS, SIZERS—General catalog of Pulva Corp., 550 High St., Perth Amboy, N. J., contains specifications and suggested applications for Pulva-Sizers, for granulating, wet milling and fine grinding, and Com-Bin feeders, for storing and feeding mastic, plastic, sticky materials or dry solids. The Pulva-Sizer is made in five sizes with motors from ¾ to 100 hp. The Com-Bin feeder is available up to 75 tph rating.

DRILLS, TOOLS—Catalog No. 747 gives complete descriptions of Leetonia mining tools, including coal and rock drills, breast augers, copper-tipped tamping tools, picks, wedges, sledges, track tools and so on. Write Leetonia Tool Co., Leetonia, Ohio.

ENGINEERING SERVICE—New brochure presents scope and features of engineering services offered by Peter F. Loftus Corp., engineering consultants, First National Bank Bldg., Pittsburgh 22, Pa. Services for mining include operational surveys, mechanization and power studies, and designs for preparation plants and tipples, haulage systems, and ventilation and drainage installations.

STEEL BELT CONVEYORS—New 48-p hard-cover book gives extensive engineering and application information on Sandvik steel belt conveyors, including characteristics, capacities, adaptations and designs. Belt is obtainable in stainless or carbon steel up to 32 in wide. The new book, available from Sandvik Steel Belt Conveyors Div., Sandvik Steel Co., Inc., Fair Lawn, N. J., also provides a step by step illustrated description of the construction of a typical steel-belt installation.

SPEED CHANGERS—Operating advantages of "Vari-Pitch" speed changers for Texrope drives, in sizes from 1 to 75 hp with output speeds up to 2,900 rpm for vertical or horizontal applications are discussed in Bulletin 20B6013D, offered by Allis-Chalmers Mfg. Co., 968 S. 70th St., Milwaukee, Wis. Included are selection tables, arrangement diagrams and speed-range tables for Vari-Pitch units, which can be made reversible by the addition of a simple tension stabilizer.

SCREENING—How the new screening action of the Symons V-Screen multiplies screening effect by combining centrifugal and gravitational forces for high-capacity wet or dry separations down to 100 mesh is a main topic of Bulletin 243, recently announced by Nordberg Mfg. Co., Milwaukee 1, Wis. Differing from conventional screens, the Symons V-Screen employs controlled diffused feed and vertical flow of material within a screening drum. Gyratory action more than doubles the capacity of the screen surface. The new bulletin also contains operating data, dimensions and information on applications in coal screening as well as in other uses.

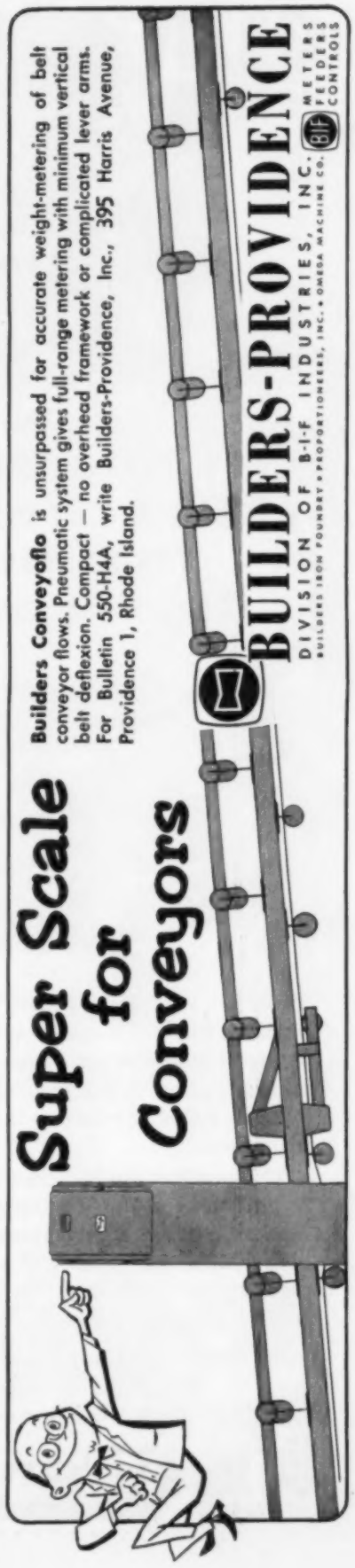
STORAGE EQUIPMENT—More than two dozen space- and time-saving ideas for using steel racks, bins, shelves and pallet frames are contained in a 16-p illustrated catalog offered by Frick-Gallagher Mfg. Co., 110 S. Michigan Ave., Wellston, Ohio. General descriptions and specifications on more than 120 models are listed.

AIR-LINE OILERS—Lubricators for use with smallest handheld drills or with largest quarry-type drills and all intermediate applications are described in Form 4169 now obtainable from Ingersoll-Rand, 11 Broadway, New York 4. Conservative estimates indicate that over 50% of air-tool failures can be traced to improper lubrication, and the bulletin describes Oil-IR's in ½ and 1 pint sizes designed to prevent this downtime. Automatic pressure equalization and adjustable oil-feed rate are features of the units, which may be filled with oil while the air tool is operating.

FLOTATION CELL—How the Denver "Sub-A" unit flotation cell operates efficiently, how it may be employed in several mineral-preparation circuits and how the units is constructed are explained in Bulletin F12-B9, recently published by Denver Equipment Co., Box 5268, Denver 17, Colo.

ARC WELDER—Bulletin 1343, from Lincoln Electric Co., Cleveland 17, Ohio, describes features and operation of the Lincoln IDEALARC, which permits the selection of a soft arc where a minimum of spatter is important or a forceful arc where high speed is desired or where electrodes tend to stick. The unit gives AC and DC welding current with both voltage and current control, and operates from a single-phase line.

BELT CONSTRUCTION — "Riffle Grip," a conveyor belt surface designed to retain or separate water content from the load on inclined belts, is the subject of a new data sheet by Industrial Products Div., B. F. Goodrich Co., Akron, Ohio. The molded cover design forms a tread which permits wet concrete to be carried without sluicing backward, if desired. Also described in the sheet are wire-inserted foundry belts and belts with stepped plies, reinforced covers and flanges.


Super Scale
for
Conveyors
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The information you'll want to have on these units is contained in Bulletins 218-R and 600. Just drop a line to Dorr-Oliver Inc., Stamford, Conn., and we'll be glad to send you a free copy of each.

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CHEMICAL RUBBER—Facts About "Hypalon," from Elastomers Division, E. I. du Pont de Nemours & Co., Wilmington 98, Del., is a new publication for maintenance, operating, and design engineers which du Pont will issue periodically. The first issue briefly describes "Hypalon" chemical rubber and details some of the outstanding attributes of this versatile new elastomer. It also includes a case-history account of how a new type of acid hose featuring a tube of "Hypalon" has already outlasted regular acid hose by four times in chromic acid service and is still going strong.

OVERHEAD LOADERS — General catalog describing 5 Austin Overshot Loader models is announced by the Austin Div., Central Ohio Steel Products Co., Galion, Ohio. The 6-p, 3-color catalog, illustrating Models 2-C, 4-C, 6-C, 7-C and 8-C, contains condensed specifications and principal dimensions. Austin Overshot Loaders, for mounting on Caterpillar tractors, are sold and serviced through Caterpillar dealers. Copies from any Caterpillar dealer or from Austin Div., Central Ohio Steel Products Co., Galion, Ohio, or 2 Santa Fe Drive, Denver, Colo.

NEW MINING TOOLS — Vascoloy-Ramet, manufacturers of tungsten carbide mining tools, announced a new mining tool catalog describing chain cutter bits, roof drill bits, finger bits, auger drill bits, rotary drill bits, percussion bits and carbide blanks for percussion bits. A new roof bit, style DR-H3, developed by V-R for heavy duty drilling in extremely hard rock, and new rotary drill bits including the V-R developed spadehead bit, three prong bits and a two prong bit, are featured. Of special interest is a chart showing practical uses and recommended drill steels for percussion bits. From Vascoloy-Ramet Corp., 800 Market St., Waukegan, Ill.

STORAGE EQUIPMENT—New 16-p catalog, by Precision Equipment Co., 3666 Milwaukee Ave., Chicago 41, Ill., discusses many new and different items in Precision's standard line of lockers, ladders, steel shelving and storage and maintenance equipment for industrial and institutional uses. The inside cover features a list of conversion factors helpful to engineers and others.

SPOT WELDER—"Aircospot," Air Reduction's inert-gas-shielded tungsten-arc spot welding process, is completely described in a reprint of an article from *Product Engineering* magazine. Over 30 tables, weld cross-section and application photographs, drawings and graphs are included. Sections are devoted to "when to consider spot welding from one side," "how the equipment operates," "standards and test procedures," "factors affecting weld quality" and "applications." From Air Reduction Sales Co., Div. of Air Reduction Co., Inc., 60 E. 42nd St., New York 17, N. Y.

SAFETY SIGNS—As an aid in preventing accidents, Ready Made Sign Co., has assembled over 2,200 of its stock metal safety signs and safety tags for illustra-

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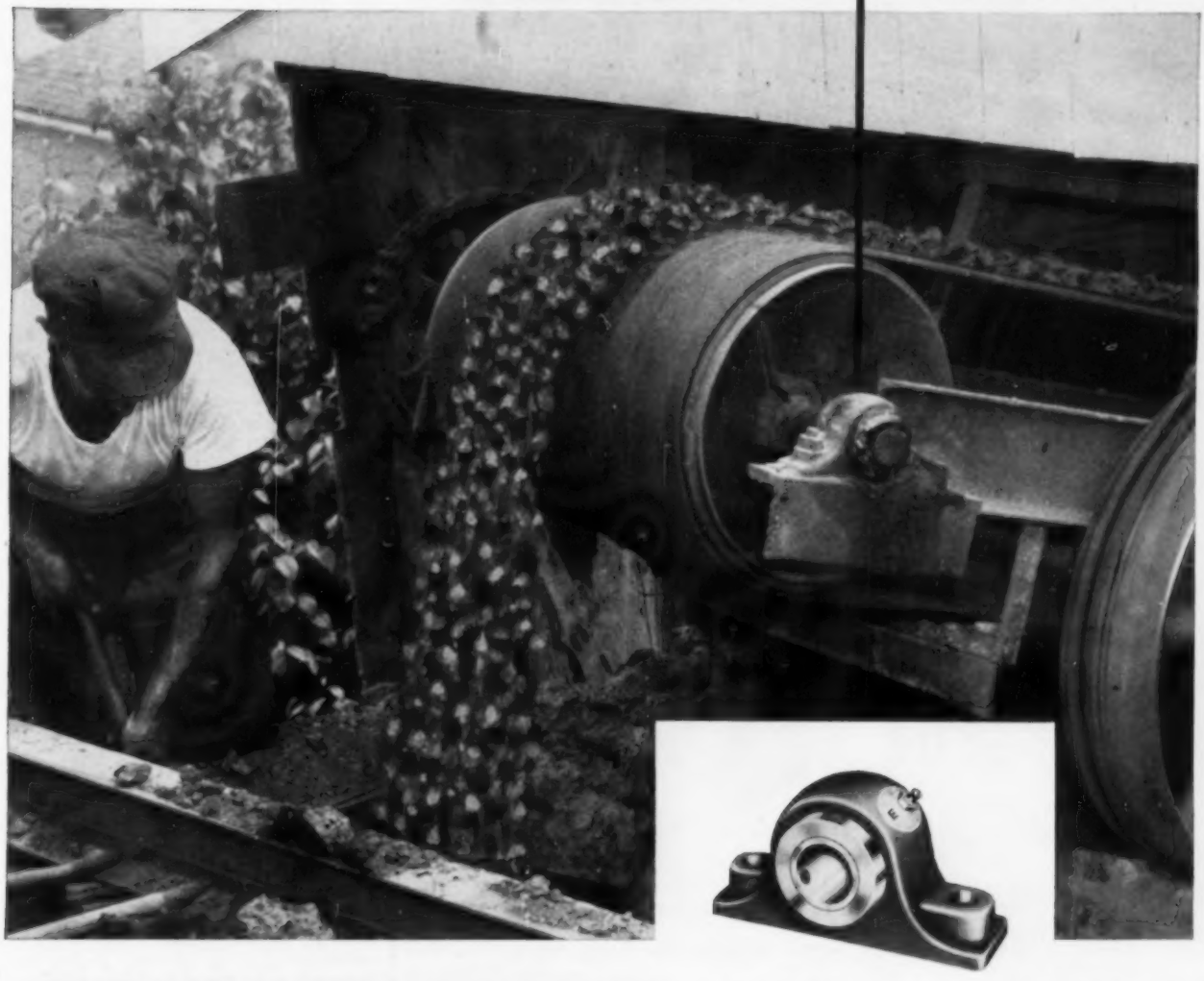

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tion in a new 48-p, 5-color catalog. Illustrated in actual colors, many in foreign languages, "Signs for Safety" are manufactured in accordance with American Standards Association specifications for industrial accident protection Z 35.1 and are made either in porcelain enamel or high-baked Dupont "Dulux" paint finishes. Catalog from Ready Made Sign Co. Inc., 115 Worth St., New York 13.

PROGRAM CONTROL — Bulletin 1130, "Program Control of Process Variables," describes the methods and advantages of employing automatic, time-conditions control for many industrial processes and tests. A convenient "selection chart" aids in choosing the right instruments for any program control application. From Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Phila. 44, Pa.

V-BELT LINE—Complete line of Maurey Mor-Grip fractional-horsepower and heavy-duty Multiple V-Drive belts are described in a new 3-color, 24-p catalog released by the maker, Maurey Mfg. Corp., 2907-23 S. Wabash Ave., Chicago 16, Ill. Multiple line consists of Super, Steel Cable, Open End and Hexagon V-belts as well as V-Link belting.

SOUND SYSTEMS—Key functions of industrial sound systems are described in 12-p booklet issued by Radio Corporation of America, Camden, N. J. In easy-to-read, non-technical language, this booklet tells how sound can be used to simplify plant administration; coordinate production; improve employee morale; provide effective voice control of all plant functions.

ORE AGGLOMERATION — Detailed descriptions, fundamental characteristics by processes and complete technical information covering the entire field of ore agglomeration is now available in a 24-p brochure just published by the Engineering and Construction Div., Koppers Co., Inc. All processes for producing particles of larger size and greater utility from fine ores—sintering, pelletizing, nodulizing, briquetting, extrusion and variations are discussed. Also featured are double-page charts giving the flow diagram of a sintering plant and mechanical features of the American Ore Reclamation Sintering Machine. Write for Ore Agglomeration booklet, E-32, to the American Ore Reclamation Section, Engineering and Construction Div., Koppers Co., Inc., Koppers Building, Pittsburgh 19, Pa.

OIL SEALS—28-p manual is arranged for quick reference and covers the selection, application and installation of Slipper Seals. Descriptions cover the latest designs including the new LPD and RPD, the extruded and moulded oil slingers and end face seals. Important points are illustrated by photos and drawings, and essential data is in tabular form for easy use. Case histories dealing with petroleum, automotive, mining, earth-moving, aviation, iron and steel, machine tool and process industries are included. Copies of "Clipper Oil Seal" available from Johns-Manville, 22 E. 40th St., New York 16.

How New Akremite Method Helps Us Cut Explosive Costs 40% to 60%

... main ingredient we use in new "make-it-yourself" explosive is Spencer Commercial Grade Ammonium Nitrate

By JAMES E. MINER, *President, Colonial Coal Mining Company*

THE "Do it yourself" fad is not restricted to the basement workshop as far as the Colonial Mining Co. is concerned. Strip miners of coal now are making their own explosive for overburden shooting.

Hugh B. Lee, president, and Robert Akre, superintendent of drilling and shooting, Maumee Collieries Co., Terre Haute, Ind., have developed a new type explosive for strip and open pit mining. Called the Akremite Blasting Process, Colonial Coal Mining Co. is now using the method under license from Maumee.

Drilling and shooting conditions will vary with each mine so that no rule of thumb can be used to show shooting costs. However, Akremite is saving us 40% to 60% compared with the cheapest commercial explosive and is giving at least equivalent results when shot on a pound for pound basis.

For a specific example of the savings, take our experience at Colonial Mine. We purchased a Bucyrus-Erie 50-R drill and began using Akremite about a year ago. For an 11-month period after using this combination we enjoyed an 18-cent per ton reduction in drilling and shooting costs over a like period before its use, while our stripping ratio was reduced by one yard, from 7½ to 1 to 6½ to 1. Depreciation of the drill is included in the calculations of cost.

The main ingredient in the Akremite Method is a commercial grade ammonium nitrate. We use Spencer Commercial Grade Ammonium Nitrate. A great deal of practical research has been done by the Spencer Chemical Company in cooperation with Maumee Collieries to produce this raw material with the proper moisture content, density, screen analysis, caking quality and ability to take the correct carbonaceous coating.

(NOTE: Spencer Chemical Company will be happy to provide you with further information about the Akremite Method as discussed by Mr. Miner.)

SPENCER CHEMICAL COMPANY
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NEWS ROUND-UP

Peabody-Sinclair Merger Forms Second Largest Coal Producer

MERGER of the Sinclair Coal Co. group of eight producing companies into the Peabody Coal Co., Chicago, was effected last month, making Peabody the second largest commercial coal producing company in the United States. With the expansion, Peabody Coal is expected to produce approximately 20 to 25 million tons of coal per year.

The top coal-producing organization in 1954, according to a study by Keystone Coal Buyers' Manual, a *Coal Age* Affiliate, was the Pittsburgh Consolidation Coal Co., with an output of 22,916,792 tons, closely followed by the U. S. Steel Co.'s captive mines, producing a total of 22,677,697 tons.

At a meeting of the board of directors of the Peabody Coal Co. held in Chicago July 25, Otto Gressens, Peabody president, was elected chairman, and L. Russell Kelce, Sinclair president, became president, succeeding Mr. Gressens.

The Sinclair properties were acquired by an exchange of 6,492,164 shares of Peabody stock, issued for the purpose following SEC approval of the plan. As indicated in the original announcement of the proposal June 6 (*Coal Age*, July, p 112), the acquisition was contingent on acceptance of owners of at least 80% of the stock of the eight companies involved. Mr. Kelce announced July 20 that 100% of the stockholders of the companies had approved the proposal.

The companies thus becoming a part of Peabody Coal are the Sentry Royalty, Power Coal, Homestead Coal, Sinclair Coal, Key Coal, Broken Aro Coal and Alston Coal companies, and Sinclair Mines, Inc. The company now has assets totaling more than $100 million. As a result of the merger, Peabody earnings are expected to be sufficient to justify resumption of dividends on preferred and common stock during 1956, it was reported.

As now set up, Peabody Coal has reserves of 1,700,000,000 tons of economically minable coal, according to company officials. Among its principal customers are 27 electric utility companies to which it will be selling coal under contracts ranging in length from 1 to 28 yr.

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Bituminous Still Gaining

Bituminous coal production's upward swing continued unabated last month. During the week ending July 16, the first full week after the miners' vacation, the industry produced 9,730,000 tons, some 140,000 tons over the week ending June 25, the previous weekly high for 1955. Output for the year through July 16 totaled 236,810,000 tons, a gain of 19.9% over the same period of 1954, according to the USBM figures. A month earlier, through June 18, the 1955 tonnage had been 18.7% ahead of 1954. In the first week following the miners' vacation, the 5-day week ending July 9, production was 7,340,000 tons, compared with 5,348,000 tons in the corresponding week of 1954. While still under last year, 1955 anthracite output also bettered its position somewhat. Tonnage through July 16, 1955, was 13,062,000 tons, 8.1% below the corresponding 1954 tonnage. The month before it had figured at 8.6% under 1954.

Kaiser Steel Buys Large New Mexico Acreage

Purchase of what it called the largest single area of coal land in the United States was announced July 26 by the Kaiser Steel Corp. It will pay $3,500,000 in cash to the St. Louis, Rocky Mountain & Pacific Coal Co., Raton, N. M., according to the announcement by Jack L. Ashby, Kaiser Steel vice president and general manager. Included in the sale are title to 202,950 acres of coal lands and coal mining rights on an additional 326,584 acres. According to an earlier announcement of the granting of an option, the property's official proven reserves total some 5 billion tons of coal "excellent" for coking purposes.

The newly acquired reserves, located in Colfax County, northeastern New Mexico, will not affect the operation of Kaiser's Sunnyside (Utah) coal mine, which produces some 1,500,000 tons annually for use at Kaiser's steel mill at Fontana, Calif. Its Utah properties would meet the company's requirements for more than 70 yr and the newly added New Mexican reserves would handle the mill's demand at the present rate of coal consumption "for many hundreds of years," Mr. Ashby said.

Production to Start on New-Model Campbell Coal Burner

AUTOMATIC SOLID FUELS EQUIPMENT, INC., through its manager, R. W. Bidlack, Jr., has announced the award of a final contract to the Illinois Iron & Bolt Co., Carpentersville, Ill., for manufacture of a new model of the Campbell coal burner. Manufacturing will be subject to specifications to be approved by the Engineering Advisory Board of Automatic Solid Fuels Equipment, Inc.

The contract was awarded after a sample Campbell coal burner was built, studied and improved by the Engineering Advisory Board. A production date of Aug. 15 is expected for the new unit.

Until the new model burner is off the production line, an inventory of about 90 of the present model (C25T) has been set up at New Albany, Ind. This inventory has been established primarily to offer units of the present model to dealers who have either quoted or sold customers on the present cost basis.

Mr. Bidlack also announced that a complete line of Freeman stokers was immediately available, ranging from the 20-lb domestic hopper model to the 750-lb commercial, bin feed or hopper model. Freeman stokers, also made by the Illinois Iron & Bolt Co., must be ordered through Automatic Solid Fuels Equipment, Inc.

Noting other developments, Mr. Bidlack said that the improved Mercoid cycle control has been approved by the engineering advisory board, after extensive field tests. This improved control is

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Wherever you use Wire Rope—for scraper loaders, mine hoists, draglines, strip shovels, on mining machinery—you'll find MONARCH WHYTE STRAND Ropes have the toughness and flexibility to give you longer heavy-duty service at lower cost. These Ropes are *designed* to serve well under the toughest going—built to fit *your* needs and service conditions.

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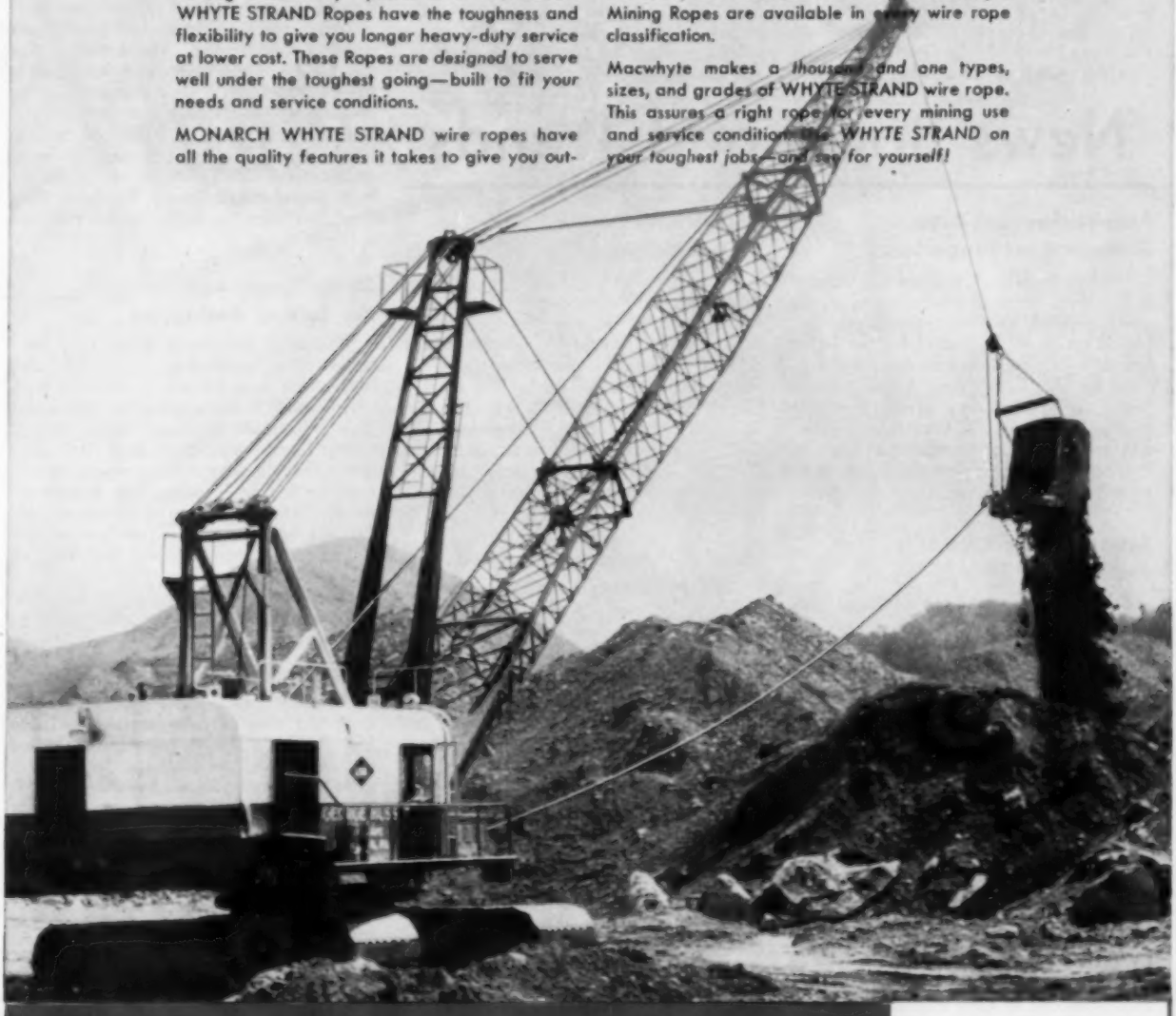
Macwhyte makes a *thousand and one* types, sizes, and grades of WHYTE STRAND wire rope. This assures a right rope for every mining use and service condition. *Use WHYTE STRAND on your toughest jobs—and see for yourself!*



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Write for WHYTE STRAND Bulletin 5425

claimed to have precision workmanship, durability, positive ignition-stoker action and a variable ignition phase setting device that allows for a maximum ignition time setting of 7¾ min. A quantity of these controls has been ordered from the Mercoid Corp.

Any correspondence with Automatic Solid Fuels Equipment, Inc., should be sent to the concern's new office address which is: 500 Board of Trade Bldg., Indianapolis 4, Ind.

Anthracite Week Set

Throughout Pennsylvania's anthracite-producing region, Anthracite Week will be celebrated Sept. 19-24. Edward G. Fox, president of the Philadelphia & Reading Coal & Iron Co., has been named honorary chairman of the Regional Anthracite Promotion Committee which makes arrangements for observance. Emphasis is being placed on newly developed automatic anthracite equipment for domestic and commercial heating. Prior to Anthracite Week, various localities in the producing region will have been visited by the "Anthracade," mobile exhibit of modern anthracite equipment.

Pottsville has been chosen "Honor City" in the region this year. It will be the center of activities throughout the state and the marketing area to call attention to the advantages of hard coal. Finalists for the title of "Queen Anthracite" will assemble at Lakewood Park, near Pottsville, Aug. 18, and the winner will be crowned by Mr. Fox that evening. The Dorsey Brothers' orchestra will play.

News Briefs and Trends

Pocahontas Fuel Buys Atwater Coal Properties

Coal properties of William C. Atwater & Co., Inc., some of which adjoin mines now operated by Pocahontas Fuel Co., Inc., have been purchased by the latter company, according to a recent announcement by H. F. Warden, Atwater president. A. R. Matthews, president, Pocahontas Fuel, said the Atwater properties will replace the approximate tonnage of Pocahontas' reserves which have been mined since 1950.

Action on Gas-Rate Bills Appears Unlikely

Bills to exempt independent gas producers from direct federal rate regulation, approved by Commerce committees in both Senate and House, have not been called up for floor action, and it appears that action is unlikely if congressional leadership goes through with plans to adjourn at the end of July.

Neely Hits Defense Department

Senator M. M. Neely (D., W. Va.) demanded July 13 that the Dept. of Defense retract a report on fuels issued by the office of an assistant secretary who later told the House Armed Services Subcommittee that he is being paid by the Esso Export Corp. The director of the issuing office, Brig. Gen. W. W. White, was a vice president of Esso Export before assuming his military post. The petroleum logistics report makes a point that imported oil is not responsible for coal's difficulties, and that a curtailmen of imports of heavy oil would not help the coal industry nor would such action be in the interests of the national defense of the United States. The report was used before the committee as part of his testimony by Charles P. Taft, president, Committee for a National Trade Policy. Senator Neely pointed out that disclosure of General White's connection with the oil company disqualified all evidence based upon the petroleum logistics report.

First Atomic Power In Distribution

The first atomic reactor to produce electricity for commercial distribution recently began feeding power into the lines of the Niagara-Mohawk Power Corp. at West Milton, N. Y., according to an announcement of the AEC. The reactor is a prototype of the one installed in the Sea Wolf, the latest atom-powered submarine. The unit produces steam to turn a 10,000-kw turbine-generator. A price of 3 mills per kwh has been established by the AEC.

Federal Government to Assist in Air-Pollution Control

A bill promising state and local governments federal aid in the amount of $25 million over a 5-yr period for control of air pollution was signed into law July 14 by President Eisenhower. The law recognizes that such control is the primary responsibility of the state and local governments and that federal participation should be limited to providing technical services, conducting research and giving financial assistance.

B&O to Order More Hoppers

In view of the high level of carloadings and indications that this will continue, the Baltimore & Ohio has gone into the market for additional freight cars. Bids have been requested on 1,000 70-ton hopper cars, 500 70-ton gondolas and 1,000 50-ft box cars, B&O president Howard E. Simpson has announced. Since Jan. 1, 1945, the railroad has spent $10,200,000 for 18,500 hoppers, 3,600 box cars, and 1,050 covered hopper cars.

Pa. House Wants Federal Purchase of Anthracite

The Pennsylvania House has adopted and passed to the Senate a resolution which would urge Congress to provide for federal purchase of 60 million tons of Pennsylvania anthracite in the next 4 yr. The resolution states that the preservation of existing anthracite mines is a vital and necessary investment in national defense because the foreign supply of fuel oil, so vital in time of war, could be easily cut off.

W. Va. Said to Need Better Strip Planting

An immediate program of replanting to conserve soil in abandoned strip mine areas of southern West Virginia has been urged by C. A. Thomas, assistant district forester for the Conservation Commission at Beckley. Mr. Thomas made his plea after completing a study of the southern part of the state where he estimates that 16,000 acres have been laid waste because of strip mining. About 80% of the acreage has been planted in accordance with a state law. This requires that a bond be posted for each acre strip mined and that plantings be approved before bond release. But the planting has been unsuccessful, Mr. Thomas says. Aside from loss of scenic beauty, he claims that there has been much permanent damage to the soil.

Study Single Agency For Selling Anthracite

Wyoming Anthracite Sales Co., patterned after Appalachian Coals, Inc., the bituminous sales agency, is a future possibility now being studied by anthracite producers in the Wyoming region, which encompasses the northern field. It is proposed that the new sales company would buy the output of subscriber producers, then sell the coal to greatest advantage. Benefits seen in such procedure would be an end to dumping and the elimination of price slashing.

Proponents of the plan point out that conditions in bituminous which led to the organization of Appalachian Coals now are present in more aggravated form in the anthracite-producing areas. Furthermore, such a company would reduce the cost of sales to the producer and would make it possible to better fill the specific needs of customers. The sales company under the proposed set-up, also would conduct market research studies with the aim of increasing the use of coal and coal products.

Headquarters would be at Wilkes-Barre, and capitalization would be in the amount of $100,000, according to reported plans. Directors would be chosen from member companies for 1-yr terms and officers would be elected for the similar terms. Member companies would appoint the new agency as exclusive sales agent, except in handling colliery coal, local sales and firm contract commitments.

USBM 1956 Program Approved

Acting Secretary of the Interior Clarence A. Davis has announced the approval by Congress of USBM's $18,863,000 budget for carrying out new and existing research programs in the mineral and allied industries. Of the total appropriation, the bureau will use $6,603,870 for its programs on solid, liquid and gaseous fuels; $300,000 for controlling fires in

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Huber-Warco Motor Graders handle all jobs efficiently and economically, with a minimum of costly "down-time" for blade adjustment on the job. The real tough jobs are a snap for the Huber-Warco Motor Graders.

Huber-Warco 4D Series Motor Graders range from 75 to 123 Horsepower. The 5D-190, with torque converter and power-shift transmission, develops 195 H.P.

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Peabody Mines Complete 100% Safety Training

A TOTAL OF 1,631 MEN, or 100% of the employees and supervisors of the Peabody Coal Co. mines in Illinois, have completed accident prevention and mine safety training since Feb. 23, 1953, L. H. Johnson, the company safety engineer, reports. Safety achievements in 1954, with training almost completed, were cited as follows: for the first time since the company has mined coal, no men were killed in or around the mines; all injuries were reduced 41%; lost time injuries were reduced 44%; and the severity of all injuries was reduced 64%. "Our goal is no injuries," Mr. Johnson adds.

The safety training course has been given to all employees and supervisors at Mines Nos. 10, 17, and 43, and Mine No. 47 Dryer Plant. Shown above, with certificates for completion of the course, are some employees and supervisors at Mine No. 43 (left) and Mine No. 47 Dryer Plant.

The training included a total of 12 hr attendance by each underground employee and 40 hr for supervisors. The course is a regularly prescribed one by the Illinois Department of Mines and Minerals, the USBM, the UMWA and the Peabody Coal Co. Class attendance was voluntary.

Mr. Johnson states that 181 men have also been trained in the use of flame safety lamps and 59 men in mine rescue apparatus and methods, making a total of 1,871 safety trainees of all kinds since Feb. 23, 1953. Two mine rescue teams now are maintaining regular practice sessions.

inactive coal deposits; $5,989,130 for studies on metallic and nonmetallic minerals; $5,000,000 for its health, safety and coal-mine inspection programs; and $970,000 for general administrative expenses. These activities will be directed from the Washington headquarters and carried on in experiment stations, laboratories, pilot plants, offices and operating mines throughout the continental United States and Alaska.

The bureau will continue research and analytical work on coal, including analyses and fuel-economy services to other government agencies that form the basis of the entire federal fuel-purchasing program. It will also continue to seek better and safer coal-mining methods. Studies will be directed toward improving methods of washing, burning, coking and gasifying coal. Research will be started to broaden the usefulness of Pennsylvania anthracite by developing methods for its use as foundry and blast-furnace fuel.

The new appropriation will enable the bureau to intensify efforts to learn the nature of and develop uses for tars produced during the low-temperature carbonization of coal. This work, together with stepped-up research on coal gasification, will permit more effective operation of the new Appalachian Experiment Station at Morgantown, W. Va. Other plans call for the resumption of experiments on gasifying unmined coal underground at Gorgas, Ala., and the study of a new method of opening passages in coal beds.

Five Scholarships Awarded

The Princess Elkhorn Coal Co., David, Ky., has announced the recipients of its 11th annual scholarship award. The five award winners this year bring to 46 the number of grants made to outstanding graduating seniors in Floyd and Johnson counties, Kentucky. The 1955 scholarship awards were as follows: Donald F. Capelli, a 4-yr grant for the study of engineering at the University of Kentucky; Joseph L. Marshall, a 4-yr grant for the study of mechanical engineering at the University of Kentucky; Myrtle Tussey, a 2-yr grant for the study of a business course at Pikeville College; Mary Lou Miller, a 2-yr grant to prepare at Pikeville College for the teaching of English; Peggy Sue Allen, a 4-yr grant to study veterinary medicine at the University of Kentucky. Presentation of awards was made by John W. Straton, scholarship chairman for Princess Elkhorn. All recipients are sons and daughters of Princess Elkhorn employees, except Miss Allen whose father is maintenance supervisor for the Floyd County Board of Education.

"Sentinels of Safety" Winners Announced by Bureau of Mines

"Sentinels of Safety" trophies, provided by *Explosives Engineer* magazine, will be awarded to six mines and quarries achieving the best safety records in their class during the 30th National Safety Competition of the USBM, Acting Secretary of the Interior Clarence A. Davis has announced. Winner among the anthracite mines (underground) was No. 5 Hill mine, Ploskonka Coal Co., Archbald, Lackawanna County, Pa., which worked 72,405 man-hours with three injuries, causing a loss of only eight days. Among bituminous coal mines (underground), Labuco mine, Alabama By-Products Corp., Birmingham, Jefferson County, Ala., won top honors for its record of 109,955 man-hours without a lost time injury. Besides a bronze trophy, each winner receives a green and white "Sentinels of Safety" flag, also donated by *Explosives Engineer*. Each employee at a winning mine receives a "Certificate of Accomplishment in Safety" from the USBM. The bureau will also award "Certificates of Achievement in Safety" to 173 other competing properties.

In the bituminous group, Certificates of Achievement in Safety will be awarded to the four runners-up, as follows: Crescent No. 2 mine, Charleroi, Washington county, Pa., operated by Republic Steel Corp., 110,455 man-hours, no lost-time injuries; Thermal mine, Birmingham, Jefferson county, Ala., operated by Alabama By-Products Corp., 93,195 man-hours, no lost-time injuries; Rock Springs No. 8 mine, Rock Springs, Sweetwater county, Wyo., operated by Union Pacific Coal Co., 77,694 man-hours, no lost-time injuries; Brock No. 4 mine, Cassville, Monongalia county, W. Va., operated by Christopher Coal Co., 64,053 man-hours, no lost-time injuries.

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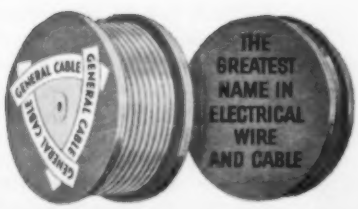

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Personal Notes

Inland Steel Names Bradbury

APPOINTMENT OF ARTHUR BRADBURY as assistant to manager, coal properties, Inland Steel Co., Wheelwright, Ky., was announced last month by H. O. Zimmerman, manager, coal properties. Mr. Bradbury has served as safety director for Inland's coal mines for the past 14 yr. In addition to his new duties, Mr. Bradbury will remain in charge of the Safety Dept.

C. R. Bourland has been appointed president of the New River Co., Mt. Hope, W. Va. He succeeds **J. A. Hunt,** who will perform special duties assigned by the company's board of directors. Mr. Hunt, a member of the board, served as president since the death of Ebersole Gaines about 2 yr ago. Mr. Bourland, who assumed his new post in June, has been associated with the company for the past 11 yr. **W. A. Haslam** was named to replace Mr. Bourland as vice president for operations. Other officers elected by the board were: **Charles E. Mahan,** vice president and general counsel; **C. E. Jones,** secretary-treasurer; **C. R. Harnsbarger,** assistant secretary; and **J. M. Wade,** assistant treasurer.

J. M. Reid and **H. H. Shaver** have been named vice presidents of the Hudson Coal Co., Scranton, Pa., G. B. Fillmore, company president, announced. Mr. Reid, formerly general manager, succeeded E. C. Weichel July 1. On the same date, Mr. Shaver, formerly general sales agent, became vice president in charge of sales. With Hudson 30 yr, Mr. Reid has served as colliery engineer, chief colliery engineer, assistant colliery superintendent, colliery superintendent and general manager. Mr. Shaver is credited with a number of innovations, among them development of the company's Sterling brand of coal.

Paul H. Duncan and **Hal M. Scrugham** have been appointed to new posts at McDowell County (W. Va.) mines, U. S. Steel Corp., according to an announcement by L. M. Lineberry, Gary district superintendent. Mr. Duncan was named assistant to the district superintendent, replacing **Robert Cooper** retired; and Mr. Scrugham superintendent of Gary No 6 mine, replacing Mr. Duncan. Mr. Duncan joined the engineering department of United States Coal & Coke Co. in 1919, subsequently being transferred to the Mingo-Logan field. He has served as superintendent of Gary No. 6 mine since 1941. Mr. Scrugham started with the company in the TC&I Div. as division operations engineer, resigning in 1953 to become mine superintendent, Alabama Power Co. He was first employed in the USS Coal Div. as assistant superintendent at Gary No. 10 mine in 1954, and was transferred to Gary No. 6 mine in the same capacity in 1955.

Other U. S. Steel promotions and transfers announced by Mr. Lineberry were: **S. L. Tuttle,** from assistant mine foreman to assistant general mine foreman, No. 14 mine; **Gadis S. Spencer,** from mine electrician, No. 10 mine, to electric shop foreman; **N. A. Meade,** from general mine foreman, No. 10 mine, to outside foreman, No. 9 mine; **Joseph W. Lavender,** from shop foreman, No. 2 mine, to assistant mine electrician, No. 14 mine; **W. D. Hooker,** from machinery repairman to assistant mine electrician, No. 10 mine; **George H. Hall,** from machinery repairman to shop foreman, No. 2 mine; **Rex H. Falvo,** from machinery repairman to assistant mine electrician, No. 6 mine; and **Warren J. Belcher,** from machinery repairman to assistant mine electrician, No. 10 mine.

Stewart L. Deck has been named general manager, Jacob's Fork Pocahontas Coal Co., Bishop, W. Va. Mr. Deck was formerly associated with the Slab Fork Coal Co., where he served as resident engineer, and as superintendent of Mary Gaston Mine No. 10. He has also been connected with the Scotia Coal & Coke Co. where he served as superintendent of the Brooklyn mine.

Completes 48 Yr With Bureau

Arno C. Fieldner has retired from the USBM after 48 yr of service. Except for 2 yr spent in directing research for the Army's Chemical Warfare Service during World War I, he has served continuously in the USBM since its creation in 1910. Inventor, author and developer of techniques used worldwide in testing and analyzing coal, coke and gas, Dr Fieldner holds many awards for scientific achievement. In 1950, after eight yr as director of the bureau's fuels research program, he was appointed chief fuels technologist. He held that position until last year when he was made a staff advisor.

Ralph E. Jamison Jr., Greensburg, Pa., has severed his official connection with the coal industry to become associated with the Pittsburgh stock brokerage firm of Moore, Leonard & Lynch. Mr. Jamison's decision was announced in a letter dated July 5 to L. C. Campbell, president of NCA, in which he said he had resigned as a vice president of Pittsburgh Consolidation Coal Co. and, therefore, was

R. M. Davis Awarded Honorary Degree by WVU

R. M. DAVIS, president, Davis-Wilson Coal Co., Morgantown, W. Va., was awarded the honorary degree of Doctor of Laws by West Virginia University May 30, in recognition of his interest in the welfare of the youth of West Virginia and his contributions to the economic growth of his community. Mr. Davis also actively promotes the cause of world peace by providing scholarships for the study of international relations, conducting essay contests for young people and through his own speaking and writing efforts. Still another interest is the Youth Center at the Wesley Methodist Church on the West Virginia campus, donated by Mr. Davis.

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resigning also as vice president and director of NCA. He had been a member of the Public Relations Commiteee and the Market Promotion Committee. He had served the public relations group as chairman until recently. For some years he was on the board of directors of Bituminous Coal Institute. Mr. Jamison joined the Pittsburgh Consolidation staff last fall when that company acquired the properties of Jamison Coal & Coke Co.

Howard B. Thorpe has been elected vice president, The North American Coal Corp., Cleveland. Mr. Thorpe also is vice president and director of The North American Coal & Dock Co., a subsidiary company.

John D. Cooner, since 1950, head, mining branch, Anthracite Research Laboratory, USBM, Schuylkill Haven, Pa., resigned that position July 15. Prior to joining the Bureau, Mr. Cooner was associated with The Hudson Coal Co., Scranton, Pa., continuously since 1916 (except for 2 yr in service in World War I), most recently as safety engineer and with prior terms of service in both engineering and production.

Clinchfield Donates Land For Park Development

A gift of 946 acres of land, donated by Clinchfield Coal Corp., Dante, Va., makes possible the earlier development of The Breaks Interstate Park in southwestern Virginia and eastern Kentucky. The area is known generally as the Grand Canyon of the East, from gorges along the Big Sandy and Cumberland Rivers within the area. It was said by M. M. Long, chairman, The Breaks Interstate Park Commission, that the coal company's gift is doubly important because the commission has limited funds, and the necessity of buying land at prevailing market prices would have seriously delayed the development of the park.

Coal Power Urged for Pacific Northwest

"The Pacific Northwest is suffering from an ever-increasing power shortage which cannot possibly be alleviated by hydro construction unless supplemented by thermal plants." In support of his statement, Floyd D. Robbins, assistant professor of electrical engineering at the University of Washington, says: "Conventional super-pressure steam plants can be built in 2 yr or less and can produce power in the 3.28 to 4.52 mills-per-kwh range. Professor Robbins, an authority on hydroelectric development in the Pacific Northwest, believes the area's power shortage, even more critical now than 4 yr ago, will continue for the next decade unless steam power plants are constructed. Steam-generating systems using a new "cyclone" furnace can, as the result of research and development, produce electricity that is "economically competitive with hydroelectric generation."

The construction of two steam generating plants is advocated, one in the Puget Sound region and the other near Vancouver, Wash., each to have two 200-mw 3,600-rpm turbogenerators. "If consideration is given to the interruptible 400-mw and the 500-mw now furnished by obsolescent steam plants, a need of new generation in the western group of the Northwest Power Pool alone of at least 1,700-mw by 1963 can be safely predicted. The picture is even more gloomy if the possibility of two successive low-water years is considered." Professor Robbins adds that the slag from Washington coals lies within the limits of the cyclone furnace and these coals will burn successfully in such a unit.

Koppers Builds New Coke Ovens for Inland Steel

Inland Steel Co. has awarded a contract to Koppers Co., Inc., for construction of a new battery of 87 coke ovens. Engineering work has been started and the construction schedule calls for completion in a year. The project is part of a multimillion-dollar construction program for the company's Indiana Harbor, Ind., works and will increase the plant's coke-making capacity by 21%, from 2,143,400 tons of coke per yr to 2,598,000 tons. The additional output will supplant coke now purchased and make the plant self-sufficinet. Koppers also will design and build additional facilities to enable Inland Steel to increase its production of coal chemicals, such as, tar, toluol, benzol, naphtha, pyridine and sulphate of ammonia.

Fire Destroys Capone Breaker at Luzerne, Pa.

A general alarm fire June 29 destroyed the Capone breaker of the Capone Coal Co., Luzerne, Pa., causing damage estimated at several hundred thousand dollars. A considerable amount of prepared coal, machinery and other equipment were destroyed. The breaker prepared coal from Prospect mines and other small independent operations. It was remodeled in 1949 and covered with metal siding. About 10 men are normally employed at the breaker but it was idle at the time of the fire due to miners' vacations. Representatives of the coal company stated that about one-half the loss is covered by insurance and the company intends rebuilding the structure.

Buffalo People Prefer Hard Coal

Taxpayers of Buffalo, N. Y., have voiced opposition to plans for converting their city-hall boilers from anthracite to oil fuel. As a result, the proposed conversion has been deferred. The proposal was criticized as an "unnecessary unwarranted expenditure of taxpayers' money," by Edward St. Clair of the United Taxpayers League before the Buffalo Common Council's finance committee. Mr. St. Clair charged the use of oil would result in much higher fuel bills and would result in no saving of manpower. Conversion of the boilers would increase the fuel bill at Buffalo City Hall by a minimum of $19,837 annually and possibly as much as $54,878 depending on the type of fuel used, it was said.

Britain Boosts Coal Price

The price of coal in Great Britain has been increased 18%. The National Coal Board, which runs the country's state-owned mines, ordered the increase mainly, it was said, because of rising costs of production. Industrial leaders estimated that the increase would add $336 million to the nation's annual coal bill. Protesting the increase, the National Union of Manufacturers called it "another twist in the rising spiral of all other prices" and warned it might mean "a further round of wage increases." Informed observers believe that the 18% price increase should be the last for success of the new drive "to sell British around the world." That success depends greatly on keeping industrial costs down so that export goods can compete favorably in foreign markets. A start has already been made in cutting Britain's coal bill. Imports now running at 12,000,000 tons per yr will be levelled off and exports may be cut by possibly 50%, reports indicate.

Bonn Needs More US Coal

West Germany will have to import about 13,900,000 tons of coal, including about 7,000,000 tons from the United States during the year ending Mar. 31, 1956. These imports are essential if the expansion of the West German economy continues at its present rate, Dr. Heinrich Kost, president of the West German Coal Mining Industry Association has stated. Coal imports from the United States in 1954-55 amounted to 1,800,000 tons. Dr. Kost said he expected that domestic coal production would continue to rise to about 131,500,000 tons in 1955-56, compared with 128,000,000 tons in 1954-55. The coal industry's own requirements—the quantities needed for coke production and export commitments—would leave about 66,300,000 tons of 1955-56 domestic production to cover the needs of the domestic economy. This quantity, however, is not sufficient to meet the considerably higher domestic demand, Dr. Kost said.

Arkansas to Get Safety Code

A general mining safety code will be established for the first time in Arkansas before the end of the year, Labor Commissioner Clarence R. Thornbrough has announced. He said the only existing mining safety laws relate to the coal fields in western Arkansas. In cooperation with the USBM, Mr. Thornbrough has already started a survey of safety regulation needs. When the survey is finished, probably about mid-summer, he will hold hearings for mine operators, miners' groups and insurance experts before promulgating the safety code. The commissioner said the code would include pit, shaft and strip operations and would extend to stone quarries and tunneling operations.

NEWSWORTHY ACTIVITIES of your company are interesting to other Coal Age readers, so tell us about them. Write The Editor, Coal Age, 330 W. 42nd St., New York 36, N. Y.

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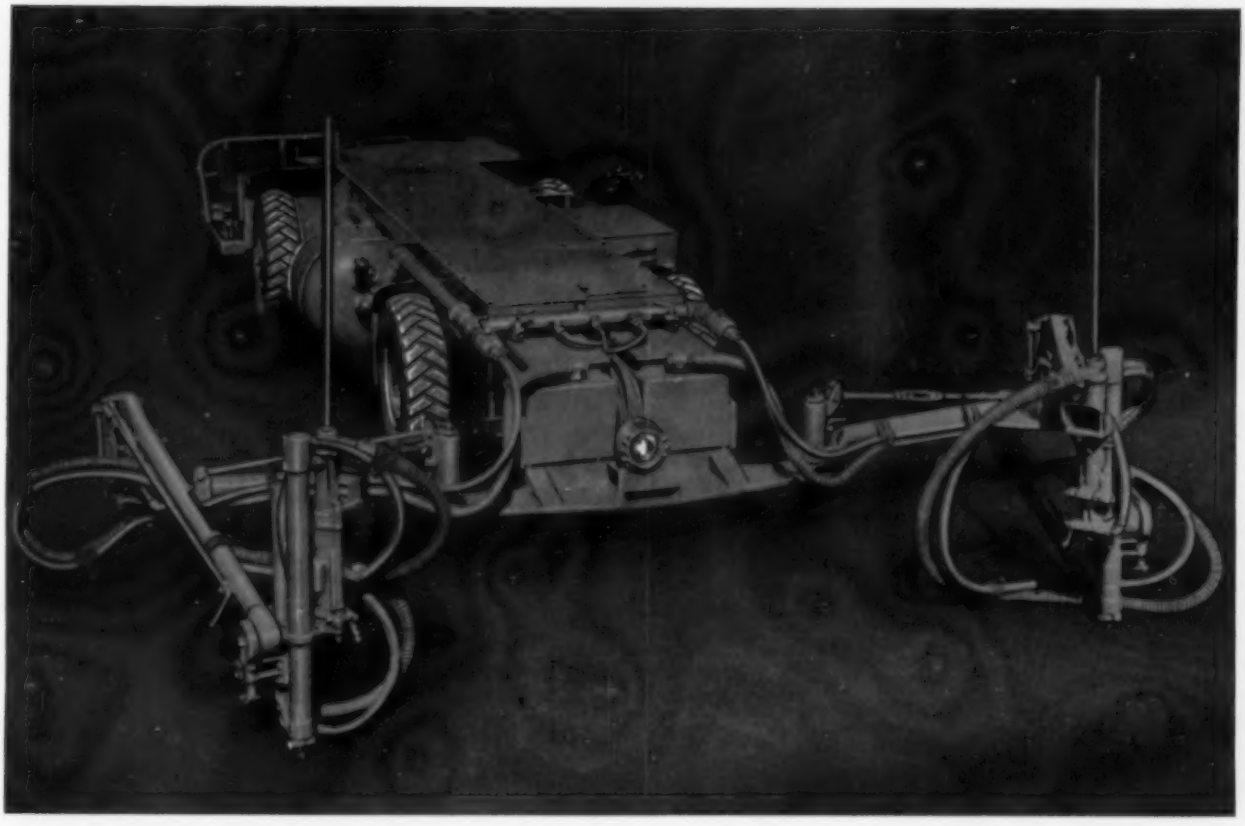

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TRAINING FOLLOWUP—Kenneth C. Lee (seated, left), retiring institute president; Ben H. Schull, Ill. Dept. of Mines & Minerals; J. J. Forbes, U. S. Bureau of Mines; and C. A. McDowell, institute secretary; standing, left, Reese H. Nicholas; M. E. Prunty, Consolidation Coal Co. (Ky.); Geo. H. Sambrook, U. S. Steel Corp; Julius C. Olzer, W. Va. Dept. of Mines; Murrell Reak, Ill. Dept. of Mines & Minerals; and L. H. Harrison, U. S. Bureau of Mines.

Mine Safety Progress and Needs Analyzed at Inspectors' Meet

INDUSTRY MEETING—
A Special COAL AGE
Staff-Written Report

CAMPAIGNS TO PREVENT ACCIDENTS from falls of roof and plans for following up safety programs were major subjects at the 45th annual convention of the Mine Inspectors' Institute of America, Springfield, Ill., July 11-13. Other subjects were electrical hazards, belt fires and auger drilling to control bumps.

Columbus, Ohio, was selected as the host city for the 1956 meeting, to be held June 2-6. The following officers were elected for the coming year:

President: Joseph Bierer, Mt. Storm, W. Va.

First Vice President: J. J. Forbes, director, U. S. Bureau of Mines, Washington, D. C.

Second Vice President: Harry J. Dusz, director of mine safety, Ohio Div. of Mines, Columbus.

Third Vice President: Ben H. Schull, director, Dept. of Mines and Minerals, Springfield, Ill.

Secretary: C. A. McDowell, Jones & Laughlin Steel Corp. (retired), California, Pa.

Assistant Secretary: Robert D. Bradford, district supervisor, District G, U. S. Bureau of Mines, McAlester, Okla.

Treasurer: Frank T. Powers, director, Md. Bureau of Mines, Frostburg.

Editor-In-Chief: J. H. Edwards, associate editor, *Coal Age*, Huntington, W. Va.

Publicity Editor: W. K. Kolnak, mine and tunnel inspection, N. Y. Department of Labor, Albany.

Session chairmen were Messrs. Schull, Forbes, Bierer and Dusz. At the opening technical session, with Reese H. Nicholas, Pittsburgh, as moderator, suggested plans for following up safety-training programs were discussed by M. E. Prunty, safety irector, Consolidation Coal Co. (Ky), Jenkins; Geo. H. Sambrook, director of mine inspection, U. S. Steel Corp., Pittsburgh; Julius C. Olzer, chief, W. Va. Dept. of Mines, Charleston; and Murrell Reak, assistant director, Ill. Dept. of Mines & Minerals, Springfield.

TRAINING FOLLOWUP

Mr. Prunty directed his attention to the group of employees who have completed all available courses and are faced with the problem of future training. "To continue to be progressive," he noted, "we can neither endlessly repeat the same courses with the same subject matter time after time nor can we simply drop those courses. Men can't be persuaded to give up their free time to classes, no matter how beneficial they may be, unless their interest is stimulated and maintained."

Mr. Prunty advocated a diversified attack and suggested seven approaches: (1) a concentrated 6- to 8-hr first-aid course reviewing the six fundamentals and eliminating all possible detail, (2) additional mine-rescue training at regular intervals with amount based on individual needs, (3) all supervisors and key personnel to receive full 40-hour course in advanced mine-rescue training and 10 to 12 hr additional yearly, (4) development of a surface employees' course, (5) development of special courses with effective new slides and films covering roof falls, haulage, fires and explosions, electricity, explosives and miscellaneous hazards, (6) encourage more men to take training for mine foremen's certificate and (7) development of follow-up courses in combination with available courses by each company or group.

"The one safest way should be taught to the workman, not as a job procedure on one hand and a safety method on the other but as a single lesson: this is the right, the safe and the only way to do the job," declared Mr. Sambrook. Continuing, he said: "We may devise safety programs and follow-ups which put particular emphasis on safety but safety itself can never be divorced from day-in-day-out job supervision."

The new series of programs designed by the U. S. Bureau of Mines and patterned after old-fashioned pep rallies has been presented to 8,300 officials and employees of the Coal Div. of U. S. Steel with 100% attendance on their own time from those who were invited. Now the program is being presented to 3,600 employees and officials at the Gary, W. Va., operations.

Visual aids being used by the Coal Operating Div. include box-graphs showing accident and severity rates posted at the portals, and "Safetygram" posters carrying a picture of one or two employees demonstrating a safe practice and bearing the individuals' names and addresses. Plans are about completed for a magazine to be distributed quarterly to all employees. Audible safety messages through loud speakers at strategic loca-

BELT FIRES, SHUTTLE-CAR SAFETY—Harry J. Dusz (left), Ohio Div. of Mines; J. V. McKenna, acting deputy secretary for Pennsylvania; Samuel P. Polack, U. S. Bureau of Mines; H. M. Gallaher, Ky. Dept. of Mines & Minerals; and Aubin Higgins, West Kentucky Coal Co.

tions and wire tape recordings also prove quite effective.

"Most accidents," Mr. Sambrook concluded, "happen because the individual is careless, inattentive or over-confident." A continual war must be waged against these common human failings if a satisfactory record is to be maintained in the mines.

STATE CONTRIBUTIONS

The expanded safety program of the last few years of the W. Va. Dept. of Mines and the present follow-up program was described by Mr. Olzer. A department man works full time helping the U. S. Bureau organize Holmes safety groups. The safety instructors help maintain the worker's interest by encouraging his suggestions regarding conditions he believes are unsafe. The good-natured rivalry of first-aid teams is a factor. Safety instructors stand ready at any and all times to go anywhere in the coal fields to spread the safety gospel, and occasionally visit the miners' homes to teach and preach safety.

As evidence of the benefits of a safety-training program given cooperatively by the Ill. Dept. of Mines & Minerals and the U. S. Bureau of Mines, beginning January, 1954, Mr. Reak said one coal company of which each employee took the course had 11 fatal accidents in 1953 and no fatality in 1954. He suggested safety followups as follows:

Daily: (1) Supervisors to resell safety over and over, making it a personal matter between the supervisor and each employee.

Weekly: (1) A 2- or 3-min talk at the beginning of the first shift each week, preferably on company time.

Monthly: (1) Management meetings with supervisory safety committee, perhaps twice a month or even weekly; (2) monthly safety letters to each foreman giving all pertinent facts on injuries.

Quarterly: (1) Meetings with safety committee of each mine; (2) a safetygram letter to each employee giving statistics and pertinent facts on accidents.

General: (1) Maintain a bulletin board at each mine for posting safety facts and posters; (2) publicize evidence that training has been successful and give credit to cooperating agencies, (3) give specialized training to instructors to help them hold the miner's attention, (4) urge 100% cooperation from the miners' organizations and ask union officials to bring to account men who jeopardize the safety of others; (5) give all new employees the full accident-prevention course and first-aid training. Finally, accept the fact that the "primary responsibility for continued interest in accident-prevention training rests with the coal operators."

PSYCHOLOGY IN SAFETY

In discussion there were several answers to a question by A. D. Sisk, chief, Ky. Dept. of Mines & Minerals, as to whether it is wise to put all the eggs in one basket by neglecting first-aid training. Mr. Forbes definitely stated that first aid and every other safety activity must be continued, that mine-rescue and recovery courses be revived, and that more safety meetings be held. He called for suggestions for rounding out the program by reaching the small mines.

Some of the Consolidation Coal Co. (Ky.) miners, said Mr. Prunty, have had first-aid training 20 or 30 times and that calls for a close analysis as to the advisability of further repetition. Robert Dixon, secretary and safety director, Kentucky River Mining Institute, Hazard, deplored the slacking of first-aid and mine-rescue training and said they should receive the same attention as accident-prevention courses. Mr. Sambrook stated that his company is not slacking off and is not letting one phase interfere with the other.

Several answered D. M. Ryan, mining engineer, St. Clairsville, Ohio, as to whether psychology is given proper attention in accident-prevention activities. J. H. Mosgrove, secretary and safety director, Big Sandy-Elkhorn Mining Institute, said that "toning" men for their responsibilities is an important part of the program in his territory. Mr. Prunty said that any educational program that succeeds is at least 60% psychology. Arthur Bradbury, assistant manager of coal mines, Inland Steel Co., Wheelwright, Ky., said the human-relations course available from the University of Kentucky is largely psychology.

The discussion veered to how to give courses to men living long distances from the mine and whether men should be paid for training. Jas. A. Boyle, chief inspector, U. S. Steel Corp., Uniontown, Pa., said they pay men for mine-rescue training but not for first aid. The instructors hold classes at the various towns to make it convenient and pleasant for the men to attend. Mr. Bradbury said his company is training 12 first-aid teams and does not pay. Prizes are given to winners of a company first-aid contest. The foremen are delegated to stir up men to organize teams. Mr. Reak said a Peabody mine has men from 18 towns and 4 or 5 counties and that the USBM and Illinois Department arranged classes in all towns and counties.

ELECTRICAL HAZARDS

"Recognition of Electrical Hazards," the final paper of the first session, by L. H. Harrison, mining-electrical engineer, USBM, Birmingham, Ala., made use of slide diagrams to point out certain electrical hazards not generally known or recognized by mine officials and inspectors. These were: (1) voltage between roof bolt and machine frame, (2) voltage between adjacent feeder borehole casings, (3) effects of unequal loads and bad bonding on ground voltages, (4) dangerous voltages between well-grounded objects —for instance, intake and discharge lines of a pump, (5) effect of opposite polarities on DC trolley systems in adjacent mines and (6) dangerous voltage on a motor-generator as a result of an open AC neutral.

ROOF FALLS

Roof-fall accidents were the major topic at the second technical session. Formal participants were Harry Gandy Jr., Dept. of Safety, National Coal Association; W. J. Schuster, safety director, Hanna Coal Co.; John L. Boardman, chairman, bureau of safety, Anaconda Copper Co.; G. G. Grieve Sr., senior engineer, National Safety Council; and R. F. Wilson, Oliver Mining Div., U. S. Steel Corp.

Reporting on the 1955 coal industry campaign to prevent roof-fall accidents, Mr. Gandy expressed confidence that the ground work has been laid for progress in the future, although 1955 did not show the drop expected. He called for harder work and more direct contact with underground workmen and officials to arouse interest. Addressing those in attendance he said: "You officials and inspectors can do much through education, guidance, enforcement and discipline toward substantially reducing accidents from falls of roof, face and rib."

The 1955 campaign, said Mr. Schuster, will go a long way toward focusing management's and workmen's attention on the necessity of safe work habits. "If all of us continue to fight roof-fall accidents

with every means at our disposal," he concluded "we will, in the coming years, note a substantial decrease in the occurrence of such accidents."

Mr. Boardman read the paper prepared jointly with Mr. Grieve which described the international campaign of the National Safety Council for prevention of falling-ground accidents at mines exclusive of coal. In the United States 237 mines have enlisted in the campaign. Eight of these, copper mines of one company, have made an overall average reduction of 10.98% in falling-ground accidents in the first 6 mo of participation.

The Oliver Mining Div., said Mr. Wilson, has reduced falls of ground accidents at the halfway mark of the 1955 campaign. Nine other companies, operating 38 underground mines in the Lake Superior Dist., and all enrolled in the NSC campaign, reported 27% reduction in falls-of-ground accidents in the first 5 mo of 1955.

Bumps in the Pocahontas No. 4 seam were discussed by Woods G. Talman, general superintendent, Gary-Lynch Dist., U. S. Steel Corp., along substantially the lines of his article in *Coal Age*, January, 1953, and his paper at the American Mining Congress Convention, *Coal Age*, June. It has proved practical, he noted, to drill loaded or heavily stressed blocks. Bumps can be triggered by drilling into loaded pillars without jeopardizing the safety of the men. By drilling 24-in holes, blocks formerly unminable have been recovered.

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AUGER SAFETY

Regulations recently put in force for auger mining in Ohio were set forth by Harry J. Dusz, director, mine safety, State of Ohio, as follows: (1) safety light at workings at all times while augering because of the danger of cutting into old mines; (2) no person to enter auger holes except to save life or equipment, and then only experienced miners with safety lamps; (3) shields to prevent materials falling from the highwall onto men; (4) highwalls to be cleared of loose material and made safe before augering; (5) hand rails along parts where men must work; (6) exhaust pipes extended to prevent fumes affecting operators and guarded to prevent burns; (7) guard on hydraulic motor fan.

Also, (8) walkway over the bit coupling directly in front of the motor cab; (9) steps on large machine on the side opposite the hydraulic motors; (10) landing on machine where it is necessary for men to stand or work; (11) adequate lighting for night work and wiring in conduit; (12) guards on moving parts; (13) no person to cross over the bits while in motion; (14) mine foreman to keep a record of depth of all holes and give data to the engineer or surveyor so the latter will not have to enter the holes; (15) holes to be filled and the face covered with spoil as soon as practical after augering is completed to prevent bootlegging of coal from the small pillars between holes.

BELT FIRES

Conveyor belt fires and standards for fire resistant belts were discussed by J. V. McKenna, acting deputy secretary of mines, Harrisburg, Pa.; S. P. Polack, health and safety engineer, USBM: and H. M. Gallaher, mining engineer, Dept. of Mines & Minerals, Lexington, Ky., at the final session, which wound up with a paper on prevention of accidents with shuttle cars, by Aubin Higgins, safety director, West Kentucky Coal Co.

To emphasize the importance of using fire-resistant belts, Mr. McKenna cited a Pennsylvania belt fire where loss of life was narrowly averted and also a fire where flame-resistant cable likely saved some men. He listed eight precautions, even when flame-resistant belts are installed: (1) good housekeeping, (2) fire equipment at strategic locations, (3) electrical equipment properly installed and protected by overload relays, (4) ventilation by separate splits of air, (5) more than two entries to insure a possible route of escape, (6) centrifugal switches to protect against increase or decrease of normal speed, (7) pull cord overhead so fall of roof will stop the belt, and (8) side limit switches at drive pulleys for protection against belt damage. He paid compliment to Kentucky by quoting its new laws for belt installations and entry ventilation.

The superiority of neoprene for conveyor belts is indicated by the following summary by Mr. Polack:

"The data show that the rubber conveyor belts used in underground installations today generate more heat from fric-

GENERAL INDEX

THE COAL AGE MINING GUIDEBOOK and BUYING DIRECTORY ISSUE

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Buying Directory
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For the first time, coal mining operating officials will have in one place, under one cover, fundamental information on every phase of mining. *What's being done* to cut costs, raise product quality and promote safety. *Why it's being done* and *how* it's accomplished. A source of helpful "know-how" basic principles.

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tion at a faster rate than neoprene belts. It is evident that the neoprene belts dissipate the heat more readily. After neoprene belts reach the temperature range of 180 to 220 C, their heating curves level off to nearly constant values in spite of increased friction by additions of weight to the belts. Some rubber belts burst into flames, others glow red and all of them break in two before the 2-hr test period is over. To this time, neoprene belts tested by this method did not flame or glow and generally did not break. The addition of coal dust and testing under ventilation aids the rubber belts to flame but does not affect the neoprene belts appreciably."

In written discussion, Mr. Gallaher quoted extensively from the new mine laws of Kentucky which, in 1954, had 50 mines using 50 miles of underground belt conveyors which handled 20,000,000 tons. From 1948 to the present, Kentucky has had 14 underground belt fires, of which seven were caused by friction and six from electrical failures.

In August, 1954, the Kentucky department employed an engineer to study underground belt conveyors in the commonwealth. This is resulting in greater uniformity of safety standards, additional safeguards on equipment and greater industry interest in preventing belt fires. Only one section of polyvinylchloride coated belt (alleged to be fire resistant) is in use in the commonwealth and it has not been in service long enough to evaluate the results.

SHUTTLE-CAR SAFETY

Shuttle cars to belts is the method of transportation in three West Kentucky Coal Co. mines, which produced 2,648,665 tons in 1954, said Mr. Higgins. Two of the mines are in the 75-in No. 11 seam and the other in the 58-in No. 9 seam. Roadways are on fireclay from 3 to 9 ft thick. In wet sections sumps generally control the water. However, in soft spots it is necessary to plank the floor. If the section is dry calcium chloride is used and makes an excellent roadway. Water also is used to allay dust.

Practically all old-type shuttle cars have been replaced with modern-type cars equipped with additional safety features. Tires are inflated with water. Cable strain has been greatly reduced by spring-type shock absorbers at the nip. In addition to the breaker boxes, pull switches are installed for use in case of fire in the box. Entries and rooms are kept in line and sharp turns eliminated when possible.

Each foreman has at least one man on each unit who is in training to operate a shuttle car. He is preparing himself for safe operation of a car under guidance of an experienced man. No one is allowed to operate a car unless designated by the foreman.

Some of the recommendations in effect are: (1) at the beginning of the shift the car operator checks mechanical condition and general performance of the car and checks the roadway conditions and clearances, (2) the operator always remains seated and faced in the direction of travel, (3) protective clothing is recommended, (4) cars are painted a distinctive color that reflects light and (5) safe clearance is maintained at all times along the roadway.

Anthracite Drainage Program Assured

Congressman Daniel J. Flood, Wilkes-Barre, Pa., has advised Pennsylvania officials to get started on the state's $17 million program for the control and drainage of water in anthracite coal mines. His advice came after President Eisenhower signed a bill (H. R. 7066) authorizing the Interior Department to pay the Commonwealth of Pennsylvania up to $8.5 million as the federal share in the program. President Eisenhower's action followed closely upon Governor Leader's signing into law a companion measure which provided for a state grant of $8.5 million to match the federal aid.

Representative Flood, sponsor of the federal authorization bill, promised an immediate try this session of Congress for a $2 million dollar appropriation to help pay for the program. Mr. Flood said he thought the chances were fair for obtaining the money immediately. And, at any rate, he feels the proposed 2-yr program is assured.

Under the mine drainage project the state mines department will construct flumes and ditches to divert surface water from entering the pits. Pumps will be installed at strategic points to drain abandoned mines.

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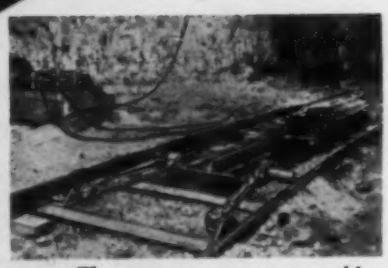

These two Nolan models will help you meet every requirement and condition in spotting cars for loading . . . *and can save you many shift hours per day!* The Porta-Feeder mounts between the rails on top of the track ties, and is secured by rail clamps. No excavation or preliminary foundation work is necessary. There are no ropes or cables. Reciprocating pushing dogs deliver constant forward feeding motion.

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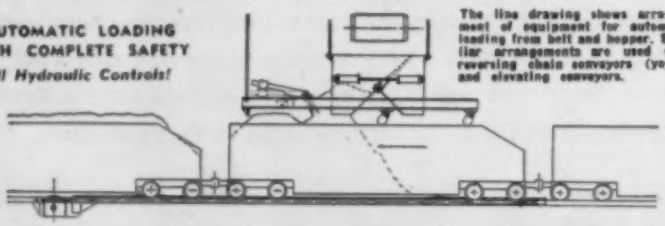

The line drawing shows arrangement of equipment for automatic loading from belt and hopper. Similar arrangements are used with reversing chain conveyors (yoyos) and elevating conveyors.

The Nolan Porta-Feeder has been in successful use in many mines for over five years. This modern method of moving cars has been accepted as the most efficient in the industry. Its ease of installation and quick movability recommends its use in any mine.

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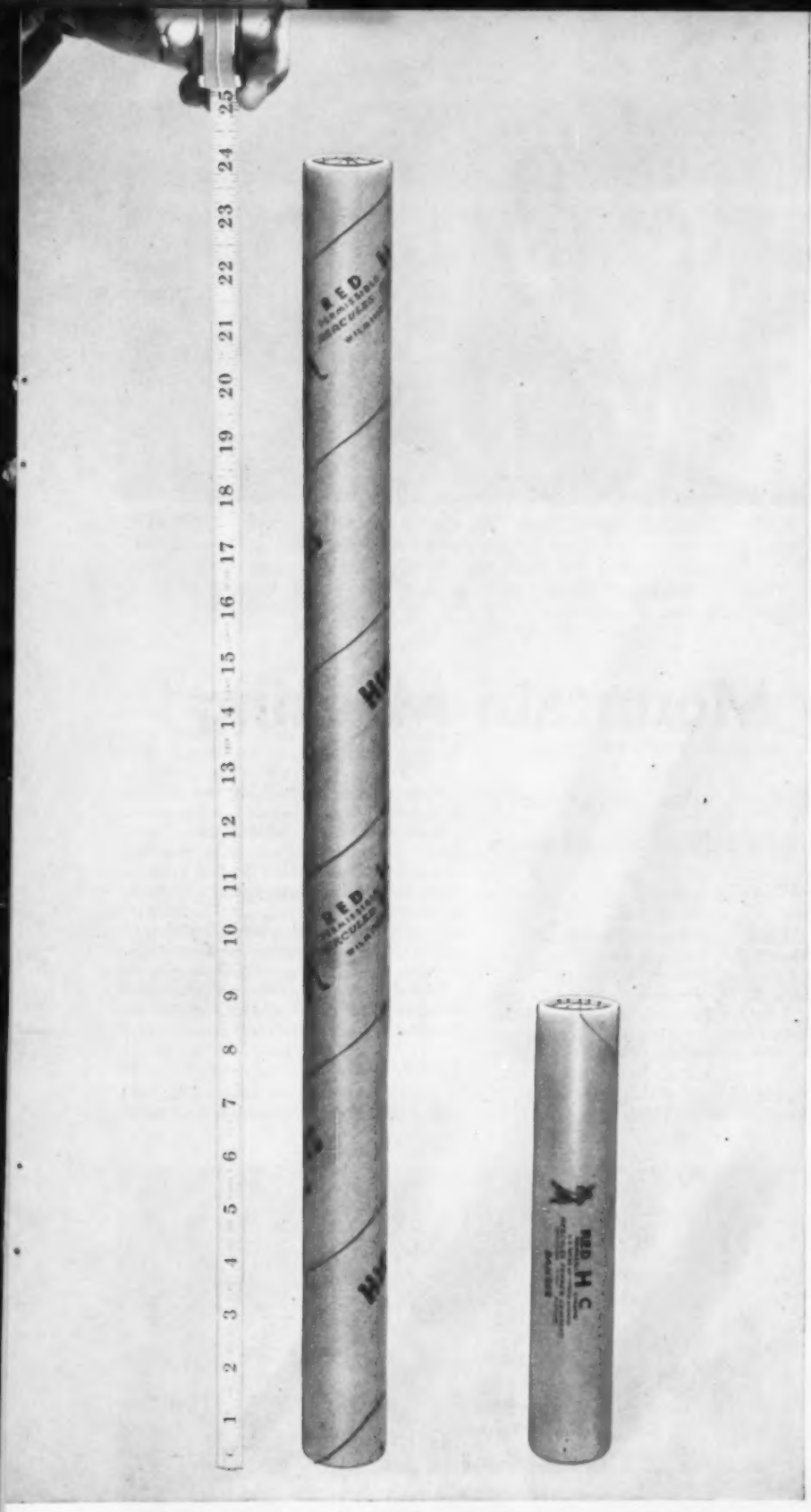

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XR55-8

HERCULES

SAFETY—Seated: James Westfield (left), USBM; John A. Garcia, New Mexico inspector of mines; J. Howard Bird, USBM; A. C. Moschetti, Colorado coal mine inspection supervisor; Lyman Fearn, Wyoming state mine inspector; and Emery Olsen, Columbia-Geneva Steel Div. Standing: Kirk V. Cammack (left), USGS; Thomas Allen, chief, Colorado coal mine inspection department; Frank C. Bennett, Colorado Fuel & Iron Corp.; and Francis Leonard, Colorado Fuel & Iron Corp.

51st Rocky Mountain Meeting

Safer mining, defense against mine fires, coal's problems in sales and government relations among main issues discussed at Colorado meeting.

SAFETY, preparation, mining methods, legislation and markets were themes at the 51st regular meeting of the Rocky Mountain Coal Mining Institute, held June 26-29, at the Hotel Colorado, Glenwood Springs, Colo.

At the business session, a resolution was passed to donate a sum of money to the Shriners' Hospital, Salt Lake City, and Childrens' Hospital, Denver, in memory of the following deceased members of the institute: George Rupp, Lee Alger, James R. Cameron, Everett E. Davis, W. J. Morris, S. M. Thompson, W. N. Wetzel and Leonard E. Ford. A second resolution was passed making the following men honorary life members: Ray H. Summer, C. M. Shott, B. W. Dyer, Frank Hicks, James Dalrymple, Bishop Ruff and R. H. Allport.

New officers elected for the coming year are listed in an accompanying panel.

J. R. Kastler, vice president, St. Louis, Rocky Mountain & Pacific Co., presided at the Monday morning lead-off session. Featured speakers were John R. Donnell, geologist, fuels branch, USGS, Denver, who discussed coking-coal deposits of Pitkin County, Colorado, and Kenneth L. Brown, district representative, Gould-National Batteries, Inc., Denver, who described the use of storage batteries in the coal mining industry.

COKING COAL

The coking-coal area, mapped in 1952 and 1953 as the Carbondale coal field,

LEGISLATION AND MARKETING—Oscar A. Glaeser (left), United States Fuel Co.; A. B. Foulger, Lion Coal Corp.; Robert E. Lee Hall, NCA; Bert Manley, Utah Coal Operators' Association; and Dr. C. J. Potter, Rochester & Pittsburgh Coal Co.

BARRETT BILL—Fred W. Bennion (left), Wyoming Taxpayers' Association; and V. O. Murray, general manager, Union Pacific Coal Co., who presided at session.

COKING COAL, STORAGE BATTERIES—John R. Donnell (left), USGS; Kenneth L. Brown, Gould-National Batteries; and J. R. Kastler, St. Louis, Rocky Mountain & Pacific Co.

RUHR MINING, COAL PREPARATION, MINE FIRES—John D. Price (left), Colorado Fuel & Iron Corp.; Lynn Huntsman, Kaiser Steel Corp.; C. A. Carlson, institute president; Fred W. Whiteside, institute secretary-treasurer; Emery Olsen, Columbia-Geneva Steel Div.; and E. C. Horne, Horne Machine Co., who served as session chairman.

had been mapped partially in the early 1900's and other sections of the field were mapped at later dates, Mr. Donnell said. Early mining operations were most successful at the Colorado Fuel & Iron properties near Gulch, at Coal Basin and in the Placeta area west of Chrystal River. Several million tons of coal were produced from these areas before they were abandoned.

The coal measures have been intruded by igneous rocks and such action may have effected the quality of the coking coal, but it is not certain whether this has happened, Mr. Donnell explained. Sandstone formations are key beds in locating and correlating the coal beds in Pitkin County.

Ranks of the coal vary from high to medium volatile, with ash content ranging from 5 to 10%, or better. Structure is steeply monoclinal to the west, with the

INDUSTRY MEETING—
A Special COAL AGE Staff-Written Report

dip ranging from 30 to 45%, and ending in an anticline to the west of Coal Basin. The dip flattens in the vicinity of Yank Creek and the axis of the anticline follows the creek. There are numerous faults in the area, with a major one near Coal Basin. There is a tremendous area available for future development, but at present there is only one active mine and another one scheduled to open in the near future, Mr. Donnell declared.

The coking quality of the coal is highest in the western part of Coal Basin but not of the best on the northern rim. In general, good-quality domestic coal is found in the northern section near the county line and good-quality coking coal is present in the southern section. The coking coal can be blended with others to make a satisfactory coke, Mr. Donnell said.

STORAGE BATTERIES

From the first application in 1886 to power a battery locomotive in England, the use of storage batteries has continually expanded. By the middle of 1917, there were 18 battery locomotives in use in West Virginia and 20 combination units in use in Kentucky. In 1938, the first battery-powered shuttle car was put in service at the Katherine Coal Co., Lumberport, W. Va. Since then, use of battery power has expanded, Mr. Brown said.

Flexibility of a battery shuttle car permits it to go where it counts and get there faster. It can be at a standby position near the loader and thus car-change time can be held to a minimum. In event of a

NEW OFFICERS—Victor Forstrom (left), Johnson Coal Co., executive board member; Robert L. Hair, Colorado Fuel & Iron Corp., president; C. E. Osborn, Kerr-McGee Industries, executive board member; E. S. O'Connor, Book Cliffs Coal Co., executive board member; Fred W. Whiteside, secretary-treasurer; Walter J. Johnson, Roundup Mining Co.; Albert M. Keenan, Thompson Creek Coal Co.; M. A. Sharp, Columbia-Geneva Steel Div., vice presidents.

power failure, the shuttle car can be used to supply the mine or haul coal. Mobility, long-range, speedy travel and fast unloading are advantages of the battery unit. There are some disadvantages, but these usually depend upon the application, Mr. Brown declared.

Based on a cost of $3,500 for a 48-cell battery with 480-amp hr (5-yr) life expectancy, operating 1½ shifts per day, 5 days per wk and 375 shifts per yr, the annual power bill is $700. With proper selection and care, a battery can be expected to have even longer life. Battery maintenance is simple and includes the following steps: connecting the battery to the charger; keeping the battery clean; adding water every week or so; giving the battery an equalizing charge periodically; and charging at the proper voltage.

Selecting the proper battery for the job is very important in getting maximum performance. It is advisable to enlist the help of the battery engineer or follow the recommendations of the equipment maker when buying a battery. The cost of a new battery today is less than it was 5 yr ago because of new developments in battery design, Mr. Brown concluded.

Coal mining and Utilization in the Ruhr District of Western Germany, by John D. Price, superintendent, by-product coke plant, Colorado Fuel & Iron Corp., Pueblo, Colo.; Coal Preparation and Related Problems of Sunnyside Operations, by Lynn Huntsman, engineer, Kaiser Steel Corp., Sunnyside, Utah, with J. Taylor and D. Ross as co-authors; and Pillar Extraction and Mine Fires, by E. O. Jackson, general superintendent, Independent Coal & Coke Co., Kenilworth, Utah, were topics at the session Monday afternoon. E. C. Horne, president, E. C. Horne Machine Co., Denver, presided.

MINING IN THE RUHR

The main reason for the industrial importance of the Ruhr district is the quanity and quality of its coal reserves. Coal is found throughout the entire area, but its quality varies considerably between the northern and southern sections. South of the Ruhr River, the coal is largely of sub-bituminous rank and is found close to the surface where it is recovered by stripping methods. Farther to the south the coal becomes lignitic, Mr. Price said.

In 1950, there were 20 strip mines in operation, producing an average of 11,000 tpd, with maximum output at 30,000 tpd. Projected output for 1963 is an average of 44,000 tons per operation, with the largest mine scheduled to produce 70,000 tons. This high output is a result of the installation of high-capacity equipment, such as the "paddle wheel dredger" which can handle 100,000 cubic meters per day or 150,000 net tons of material. In some cases these units will be moving up to 750 ft of overburden, Mr. Price declared. Another trend to larger equipment is reflected in replacement of 22-ton coal "wagons" by large "tipping wagons" that are 265 tons gross weight, and carry 92 to 115 cu yd of material.

Coals of metallurgical quality are found north of the Ruhr River. Although the total number of beds is not known, 108 have been identified and worked to a depth of 3,000 ft below the surface. About 60 billion tons of coal is present down to the 3,000-ft level. Because of the extremely high temperature in the mines and the lack of mechanical equipment, output per man-day is only 1.75 tons.

Damage to mines by bombing during the war was extensive but recovery has been phenomenal and by 1952 production was approaching pre-war levels. Since the war there has been a reluctance on the part of the younger men to take up coal mining. As a result, the average age of the coal miner now is 15 to 20 yr above the pre-war average, Mr. Price explained.

The volatile content of the coals decreases rapidly as the depth of the beds increases and grades of coal varying between 8 to 50% volatile matter may be hoisted from the same shaft. Different types of coal are mined, hoisted and prepared separately.

Over 150 mines produce coal in the Ruhr, with the great majority of them located in the northern half. About 80 coke plants also are located in the northern section, adjoining the pit mouths. Coal-chemical plants also flourish in the Ruhr and large-scale research is being carried on in the field of coal utilization and carbonization, Mr. Price declared.

1955-56 RMCMI Officers

President—R. L. Hair, general superintendent, fuel mines, Colorado Fuel & Iron Corp., Pueblo, Colo.

Secretary-treasurer—F. W. Whiteside, consulting engineer, Denver, Colo.

Vice Presidents—For Colorado, A. M. Keenan, president, Thompson Creek Coal & Coke Co., Denver. For Wyoming, M. Zakotnik, Jr., general superintendent, Kemmerer Coal Co., Kemmerer, Wyo. For Utah, M. A. Sharp, superintendent, Geneva mine, United States Steel Corp., Dragerton, Utah. For New Mexico, W. K. Dennison, Jr., superintendent, St. Louis, Rocky Mountain & Pacific Co., Koehler, N. Mex. For Montana, Walter J. Johnson, president, Roundup Mining Co. and Mountain States Mining Co., Roundup, Mont.

Executive Board — For Colorado, Tony Bear, partner, Bear Coal Co., Somerset, and W. M. Bellairs, E. I. DuPont de Nemours & Co., Denver. For Wyoming, I. M. Charles, chief engineer, Union Pacific Coal Co., Rock Springs, and C. C. Boley, Natural Resources Research Institute, Univ. of Wyoming, Laramie. For Utah, E. S. O'Connor, president, Book Cliffs Coal Co., Salt Lake City, and E. O. Jackson, general superintendent, Independent Coal & Coke Co., Kenilworth. For New Mexico, C. E. Osborn, Kerr-McGee Industries, Shiprock, and J. A. Garcia, chief inspector of mines, Albuquerque. For Montana, J. J. Fisher, Roundup Mining Co., Roundup, and Victor Forstrum, partner, Johnson Coal Co., Roundup.

PREPARATION AT SUNNYSIDE

To get the greatest recovery of coal possible, full-seam mining is practiced at Sunnyside. From 20 to 25% reject is handled in the cleaning plant with this type of mining, said Mr. Huntsman.

In brief, the coal is delivered to the plant in mine cars and reduced to 6 x 0 in a rotary breaker. It then flows by conveyor belt to a 3,500-ton blending bin that provides a uniform feed to the wash boxes and provides storage capacity if there is a plant failure.

Washing units include three Baum jigs and two McNally wash boxes. Refuse is crushed and recirculated in a Link-Belt wash box. Clean coal is separated on two screens and the ⅛x0 passes to a drag recovery tank and is carried to CMI centrifugal driers. Overflow from the drag tank is delivered to weir boxes and a Dorr thickener. Underflow from the thickener is sent to a pair of agitator tanks where kerosene is added before it is delivered to Denver Sub A flotation units.

The clean concentrate goes to a settling cone and the waste containing 55% ash is sluiced to a 60-ft Wemco thickener where lime is added to flocculate the solids. The thickened material is then pumped to a settling pond. Overflow from the thickener is recirculated to the flotation units and used as push water. The 28M x 0 coal is dewatered by an Eimco filter and delivered to a conveyor for loading. Continuous mining has increased the fine-coal cleaning problem, Mr. Huntsman said.

Mr. Jackson's paper was read by Emery Olsen, superintendent of safety, Columbia-Geneva Steel Div. Mines fires have become a major problem at Kenilworth. Their frequent occurrence and the cost of dealing with them along with the loss of production have caused management and workers to be concerned. Much study and careful consideration of the facts along with help from mining men outside the company has resulted in theories being formulated as to the cause of the fires and the steps needed to lessen the danger, Mr. Olsen reported.

At Kenilworth, a working section formerly could be open to development and pillar work for a period of 10 to 15 yr without danger of a mine fire. Recently, sections have fired a short time after pillar extraction was begun. Since the system of extracting pillars is about the same as before, the only change management thinks effects firing is the method of ventilation.

Early ventilation practice was to course air over the front of the pillar line and return it to a bleeder entry at the upper end of a 1,500-ft block. Crosscuts were tapped to the bleeder from the main block at 500 ft intervals. This system made it possible to ventilate all working areas with fresh air, sweep the front of the cave and return the air to the main bleeder without coursing air over the gob or cave area. Since little air found its way into the caved area, management be-

(*Continued on p 154*)

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OPENING SESSION, West Virginia Coal Mining Institute—Seated: Roland C. Luther (left), Peerless Coal & Coke Co., institute president; T. W. Howard, The New River Co., and C. E. Hough, Norton Coal Co., session chairmen; and S. Dunlap Brady Jr., The Gauley Co., program committee chairman. Standing: Warren G. Montgomery (left), Jeffrey Mfg. Co.; Victor Hurley, Warner Collieries Co.; and G. R. Spindler, West Virginia University, institute secretary-treasurer.

West Virginia Institute Views Mining and Industry Developments

INDUSTRY MEETING—
A Special COAL AGE
Staff-Written Report

PRODUCTION GAINS through industrial engineering, performance of continuous miners in low and high coals and with extensible belts, chemicals from coal, public relations, origin and make-up of coal, belt haulage and roof control with German-plow mining were topics at the spring meeting of the West Virginia Coal Mining Institute, held June 24-25 at the Daniel Boone Hotel, Charleston, W. Va.

Roland C. Luther, executive vice president, Peerless Coal & Coke Co., and president of the institute, opened the meeting and presided at the dinner at which Gov. William C. Marland was the speaker. S. Dunlap Brady Jr., mining engineer, The Gauley Co., and chairman of the program committee presided at a luncheon, which featured an illustrated talk, "West Virginia Coal—A Basic Raw Material for the Chemical Industry," presented by Henry W. Schweinsberg, general production superintendent, E. I. du Pont de Nemours & Co., Inc., Belle, W. Va.

Session chairmen were: T. W. Howard, mining engineer, The New River Co.; C. E. Hough, president, Norton Coal Co.; Herbert E. Jones Jr., executive vice president, Amherst Coal Co.; George L. Judy, vice president, Consolidation Coal Co. (W. Va.); R. Glen Lazelle, research engineer, Island Creek Coal Co.; and Jesse Redyard, president, Redyard Coal Co.

INDUSTRIAL ENGINEERING CUTS COAL MINING COSTS

Total labor cost at a new mine of the Warner Collieries dropped over $1 per ton in the 6 mo following application of industrial engineering methods, reported Victor Hurley, superintendent, The Warner Collieries Co., Mammoth, W. Va.

Mr. Hurley's paper, summarizing the fundamentals of industrial engineering, its practical application to coal mine operation and some of the results possible, appears on pp 72-75 of this issue.

CONTINUOUS MINING WITH LOW-TYPE MACHINE

Colmols served by two shuttle cars are producing 250 to 330 tons per shift, with 450 tons maximum, in 42-in coal, said Warren G. Montgomery, district sales manager, Jeffrey Mfg. Co., Johnstown, Pa., in his talk on performance of the Colmol in low coal. Brief experience with bridge conveyors has indicated possibilities of 350 to 600 tons per shift. His paper referred primarily to mines in the Lower Kittanning seam, also known as the Miller or "B" seam.

The low-type Colmol possibly will work in a minimum height of 36 in but the practical lower limit is 38 in, Mr. Montgomery said. Its producing rate is 2 to 4 tons per min and the usual crew is four to six men. Rate of advance in the "B" seam is 24 to 33 in per min, but in the harder seams it goes down as low as 18 in per min. Early bit cost in the "B" seam, with rolls present, was as high as 25c per ton but was brought down to 5c. Where no rolls are present, bit cost is less than 1c per ton. Sulphur can send the bit cost up to 50c per ton.

The low-type Colmol has three 50-hp motors and the recommended arrangement for 275-v trailing cables consists of three individual cables, two of 350,000 cir mil for positive and negative and the other 4/0 for ground. Electrical experience with 440-v (AC) machines has been very good, Mr. Montgomery reported.

During discussion, John Crichton, vice president-operations, Johnstown Coal & Coke Co., said that his company has one low-type Colmol operating in the "B" seam with a Fletcher drill which installs from 90 to 135 roof bolts per shift and two Colmols in the Sewell seam of West Virginia discharging to "souped-up" 12-BU loaders equipped with Piggybacks. The number of flights in the loader conveyor and the room conveyor have been doubled so as to take the coal away.

EXPANDED RESEARCH NEEDED

The coal industry should expand its research, Mr. Schweinsberg emphasized during his luncheon talk. du Pont's Belle plant now is putting into operation the first unit of a coal partial-combustion process to produce synthesis gas, he reported. The company has spent $3 to $5 million to develop this process, in which pulverized coal is treated with superheated steam under high pressure. The Belle plant has been using the coke-oven water-gas process. Thirty major chemical products are made from coal at the Belle plant and coal consumption is over 1,500,000 tons per year. The 11 chemical plants in the Kanawha Valley use 12,000 tons of coal daily.

Synthesis gas made from natural gas costs less than one-half of that made from coal, which explains the migration of plants of five large chemical companies to the Louisiana-Texas Gulf Coast, Mr. Schweinsberg said.

BORING-TYPE MINER IN PITTSBURGH SEAM

Over a 4-mo period in Federal No. 1 mine, Eastern Gas & Fuel Associates, a

AFTERNOON MEETING—Herbert E. Jones Jr. (left), Amherst Coal Co., and George L. Judy, Consolidation Coal Co. (W. Va.), session chairmen; K. S. Hobbs, EG&FA; Aureal T. Cross, W. Va. Geological Survey; and Prince Thornton, Appalachian Power Co.

SATURDAY MORNING SESSION—Seated: Jesse Redyard (left), Redyard Coal Co., and R. Glen Lazelle, Island Creek Coal Co., session chairmen; Standing: J. S. Mathews (left), Compass Coal Co.; Edwin P. Sheriff, EG&FA; and R. U. Jackson, Hewitt-Robins, Inc.

Goodman Type 500 miner averaged 430 tons per shift, hit a peak of 624 tons, or 90 tons per producer, worked with a bit cost of 3c per ton and achieved a sectional cost 54% under conventional mining, reported K. S. Hobbs, EG&FA production engineer. The Type 500 miner, a modification of the McKinlay boring-type unit, makes an advance cut 7 ft high by 13 ft 2 in wide, weighs 36 tons and is driven by one 100-hp and one 50-hp motor.

Federal No. 1 is in the Pittsburgh seam. The miner is served by a 11-BU loader and two 5-SC shuttle cars. Roof bolting, with a Fletcher unit, consists of one line of bolts spaced 4 ft on the center line of the flat span between the coal arches left by the machine.

The miner was put into operation June 1, 1954, and has worked in a three-heading panel, with a belt on the center heading. Rooms are driven 270 ft deep and crosscuts made at 90 ft. The blocks thus formed are split three times and 5-ft fenders left. Compared to conventional mining, screen tests show an increase of 12.6% in the 5x2 size, a decrease of 3% in the 2x1¼, a drop of 5.6% in the 1¼x¾ and a decrease of 3.1% in the ¾x0, Mr. Hobbs said.

COAL ORIGIN AND MAKEUP

Aureal T. Cross, coal geologist and paleobotanist, West Virginia Geological Survey, illustrated his discussion on the origin and make-up of coal with slides and specimens, and explained how examinations of micro sections can identify most seams. In his presentation, he followed the origin of coal from the beginning of plant life up to the present.

COAL'S PROGRESS AND FUTURE

Prince Thornton, public relations department, Appalachian Power Co., Roanoke, Va., gave his talk, "Black Magic," which is designed for understanding by luncheon clubs, school groups and other public gatherings. Using numerous large cards with drawings, cartoons and condensed data, Mr. Thornton traced the bituminous coal industry's development and progress, emphasizing its importance to the Nation's economy and its prospects for future growth.

CONTINUOUS MINING WITH EXTENSIBLE BELT

J. S. Mathews, division superintendent, Compass Coal Co., Clarksburg, W. Va., described the use of a Joy 1CM2 continuous miner with a Joy extensible belt in the Pittsburgh seam. Total mining height is 7½ to 8 ft. While no head coal is left, 12 to 18 in of bottom coal is left because 8 in or less breaks through to the soft bottom. Mr. Mathews reported that since preparing his paper, which was presented at the Lexington, Ky., AIME meeting (July *Coal Age*, p 120), the machine has achieved a maximum advance of 163 ft and produced 831 tons in one shift.

LONGWALL ROOF CONTROL IN PLANER MINING

Longwall roof control in the Stotesbury No. 8 mine of the Eastern Gas & Fuel Associates, which uses a German planer in 40-in soft friable coal of the Pocahontas No. 3 seam, was the subject of an illustrated talk by Edwin P. Sheriff, mining engineer, Stotesbury. The plow has mined four 2,200-ft panels 328 ft wide and three-quarters of a panel 400 ft wide. Intensive observations, tests and studies of the roof action have been made.

Cover averages 750 ft, with a maximum of 1,300 ft. It is believed that 40 to 100 ft of sandstone lies 50 to 75 ft above the coal. At the start of a new panel, roof pressures are light. After 50 ft of retreat, some immediate roof has fallen and after 100 ft, all has fallen to about a 20-ft height, with possible exceptions at the head and tail ends. Major falls occur after 150 ft. Once 300 to 400 ft of retreat has been completed and a good breakline established, falls of the immediate roof occur regularly when 4 to 18 ft of roof becomes unsupported by retreat of the face.

In place of the non-yielding props requiring high maintenance that were first used, all props now are of yielding types. There is one prop for each foot of face, set in staggered rows 2 ft apart. Steel cantilever bars 39 in long are used for headers over the props. Secondary support consists of wood cribs with steel chock releases and all the cribs are recovered.

In answering questions from the floor, Mr. Sheriff said that 360,000 tons has been mined by the plow in 22 mo of operation. The safety record has been about the same as that obtained with conventional mining. There was one fatality caused by a non-conformity in the roof. Most injuries have been to fingers, in handling the 125-lb jacks and 55-lb cantilever bars. Jack setters have to move about 20 jacks per shift, each move requiring about 5 min. Recovery in a panel is about 90%, not including the barrier pillar. Each of two shifts employs 35 men, with four on a supply shift, and face advance is 10 to 25 ft per shift. Production is 15 to 20 tons per man-shift, compared to 9 to 10 tons for conventional mining, Mr. Sheriff reported.

CONVEYOR-BELT HAULAGE

A paper on "Conveyor Belt Haulage" by R. U. Jackson, manager, mining division, Hewitt-Robins, Inc., Passaic, N. J., covered belt development, selection, installation, controls, maintenance and fire protection. Mr. Jackson emphasized steps in belt improvement by citing comparative figures on the distances a 30-in belt could carry 400 tph horizontally or vertically. Beginning with 1891 when Hewitt-Robins built the first conveyor belt which was good enough to carry 1,750 ft or elevate 55 ft, Mr. Jackson traced developments as follows: 1930 (42-oz duck), 1¼ mi or 167 ft; 1948 (rayon and nylon), 3½ mi or 500 ft; and 1955

(*Continued on p 132*)

(improved rayon and nylon), 5¾ mi or 830 ft.

Commenting on service haulage conveyor units such as shuttle belts and extensible belts, Mr. Jackson said:

"Continuous mining, or progressive advancement by one unit, will control the design of future mining systems. Because of this fact, where local conditions permit, rooms will be driven much deeper, to take advantage of rapid advancement of the machine. Why place a continuous machine that can advance 200 ft per day in a 350-ft room? If the service haulage will permit, why should rooms not be advanced 800 ft deep or 2,000 ft deep or even deeper?

Prefacing his discussion of belt maintenance, he stated: "The beginning and ending of proper conveyor maintenance is good housekeeping, which does not mean the cleanup of a conveyor line once each month or two, but it means maintaining a clean conveyor system at all times."

The principal causes of belt fires and the steps necessary for their avoidance were outlined by Mr. Jackson as follows:

"1. Drive pulley slippage, where the slack drive side driving tension has been removed or the belt stalled from an outside source such as a roof fall. This condition should be eliminated by use of the automatic counterweighted take-up for control of driving tension and drive pulley slippage control for the stalled belt.

"2. Return idlers become stuck. This condition will not cause a belt fire from overheating of the idler pulley itself. It is practically impossible to ignite a moving belt. However, if you permit oil and grease and fine coal to build up around a return idler, it is possible to start a fire. Good housekeeping by your belt man will definitely eliminate these causes.

"3. Belt running against conveyor frames. Here again, the moving belt will not cause a belt fire. Proper maintenance and inspection by a belt man will eliminate this condition, as the misalignment of the belt or frame will damage the belt.

"4. Belt fires from outside source such as a short-circuited power line. Is there any reason why these power lines should not be carried in a parallel entry and where necessary to connect drives, controls, etc., be carried through conduit?"

Mr. Jackson concluded his paper by reporting that specifications for the manufacture and testing of fire-resistant belts will be issued in the very near future as a result of the cooperation of the Rubber Mfg. Association, USBM and National Coal Association. "These specifications will no doubt require not only the covers to be fire-resistant but complete penetration of the carcass by the same material, such as neoprene," he said.

EQUIPMENT APPROVALS

Three approvals of permissible equipment were issued by the U. S. Bureau of Mines in June, as follows:

Joy Mfg. Co.—Type 1CM-2AE-F continuous miner: seven motors, four 7½-hp, one 15-hp, and two 100-hp, 200 and 500 v, DC. Approvals 2-1068 and 2-1068A; June 1.

Cross Pump & Equipment Co.—Cross-Deming Pump: one 3-hp motor, 250 v, DC. Approval 2-1069; June 17.

Obituaries

George T. Alley, 60, superintendent of the Green Diamond mine, Mid-Continent Coal Corp., Marissa, Ill., died July 13 in Marissa. Mr. Alley had been superintendent of Green Diamond for 5 yr.

Michael J. Scollard, 83, secretary of the Indiana Coal Producers' Association from 1918 until his retirement in 1945, died in Terre Haute, Ind., July 9. Mr. Scollard took active part in industry wage negotiations during his service in Indiana. Prior to becoming secretary of the Indiana group, he had served as Indiana state mine inspector under three administrations.

Richard Rowlands, retired shaft foreman of Woodward Colliery, Glen Alden Corp., died July 11 in Edwardsville, Pa. Mr. Rowlands was born in Wales and came to this country when a young man. He had worked for Glen Alden 55 yr, retiring 3 yr ago.

James J. Morris, former secretary-treasurer, Kentucky River Coal Co., Lexington, Ky., died July 1 at Gadsden, Ala. Mr. Morris joined the Kentucky River Coal Co. in 1920 as assistant to the president and was secretary-treasurer of the company for 15 yr prior to his retirement in 1939. He moved to Alabama 6 yr ago.

Fred Lee Kemp, 64, co-owner, Kemp & Johnson Coal Co., Clarksville, Ark., was electrocuted July 3 while at work in the mine. In coal mining since he was 13 pr of age, Mr. Kemp organized his first coal company in 1936, and has operated mines continuously since then.

Association Activities

ACSA Calls for Action

The American Coal Sales Association held the largest convention in the association's 38-yr history in June at White Sulphur Springs, W. Va. Highlight of the convention was an address by W. W. Bayfield, executive vice president of the association, who urged the coal industry to face up to its needs by expansion of sales and engineering training and education, market promotion, technical and market research, and the elimination of duplicate services by trade associations. S. L. Jewell, Southern Coal Co., Inc., president of the association, and all other incumbent officers were re-elected. Added to the executive committee for 3-yr terms were John Gaido, New York; Huston St. Clair, Jewell Ridge Coal Sales Co.; and B. R. Thompson, Garland Coal Co. The following new members were elected to the 73-man board of directors: Vernon B. Bickmore, Silverbrook Coal Co.; W. A. Brandt, Lafayette Coal Co.; Paul V. Callis, Tennessee Consolidated Coal Co.; Joseph W. Hoffman, Blue Diamond Coal Co.; R. C. Huston, Reliable Coal & Mining Co.; S. P. Hutchinson, General Coal Co.; J. W. Kepler, Pittsburgh Consolidation Coal Co.; E. H. LaRue, Princess Coal Sales Co.; Gilbert P. Remey, United Eastern Coal Sales Co.; Frank G. Smith, Sunday Creek Coal Co.; Clyde E. Speer, Clyde E. Speer Coal Co.; R. B. Starek, Old Ben Coal Corp.; H. G. Ward, Brown-Ward Div., Sunnyhill Coal Sales Co.; and J. N. Wolbert, C. W. Claflin Co.

Anthracite AIME Elects New Officers

W. J. Parton, consulting engineer, Philadelphia, Pa., was elected chairman of the Pennsylvania Anthracite Section, AIME, succeeding W. W. Everett, vice president, Glen Alden Corp., Wilkes-Barre, Pa., at the annual summer meeting of the group July 14 at Irem Temple Country Club, Dallas, Pa. Other new officers are: vice chairman—Floyd S. Sanders, district manager, Goodman Mfg. Co., Wilkes-Barre; and secretary-treasurer—Thomas W. Weichel, mining-electrical engineer, Okonite Corp., Wilkes-Barre. At the same meeting R. Y. Williams, consultant, Pottsville, Pa., was awarded the Legion of Honor of AIME for 50 yr of continuous membership.

MEMMA Names Molinski

A. E. Molinski, Bethlehem Mines Corp., Johnstown, Pa., has been elected secretary-treasurer of the Mining Electro-Mechanical Maintenance Association.

Set Date for Pa. Safety Meet

The Pennsylvania State Bituminous Safety Association, meeting in Ebensburg, Pa., June 17, decided to hold its 1955 state-wide meet in Carmichaels, Pa., Saturday, Sept. 10. Lewis Evans, president of the association and Pennsylvania Deputy Secretary of Mines, appointed B. W. Deringer, chairman, finance committee, and D. J. Keenan, general chairman of the meet. Named members of the rules committee were: George Chulick, chairman; John Kelly, John Doorley, John Mlakar, Fred Wise, C. H. Maize, J. V. Berry, J. A. Boyle, Henry Burdelsky, C. L. Dalzell and William Demkowicz.

Scholarships Announced

Nine freshman scholarships for the Missouri School of Mines and Metallurgy, Rolla, Mo., have been announced by Dean Curtis L. Wilson, and H. S. Pence, president of the Missouri School of Mines Alumni Association, the sponsoring organization. The scholarships carry a cash award of $500 for the freshman year and are based upon high-school scholastic standing, leadership and the comparative results of engineering aptitude tests. With the exception of one scholarship, there are no geographic restrictions. Applications for these scholarships must be on file prior to Feb. 1 for entrance in the fall semester.

US RUBBER

United States Rubber Company 4-year project pays off—
construction men report they're well ahead with U. S. Royal!

"On rock work, tire service increased 300%"
says H. Earl Parker, Marysville, Calif.

"On tough jobs like Pine Flat Dam, we've had a tremendous increase in tire service since we switched to U. S. Royal Nylon Con-Trak-Tors. This has meant a substantial decrease in downtime on heavy equipment and a real economy for us in operating costs."

Tire Life Greatly Increased!

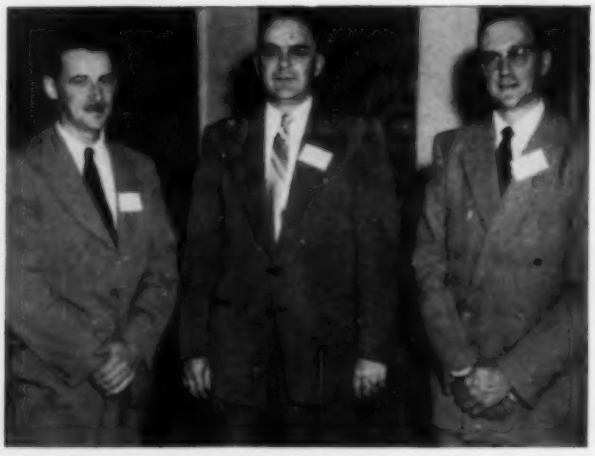
The U. S. Royal Con-Trak-Tor, an important result of U. S. Royal's 4-Year Truck Tire Project, is increasing service life and reducing equipment downtime for leading construction men like Mr. Parker.

Good reasons, too! The Con-Trak-Tor's *Nylon cord carcass* stands up to vicious shocks, fights off rocks and snags. It has *triple impact protection*—extra rubber between plies, double shock-pads under the tread, extra-tough construction at the crown. Its *full lug traction* pulls right through toughest going, just *won't* bog down.

Why not let the U. S. Royal Con-Trak-Tor increase *your* tire service, reduce *your* downtime, lower *your* operating costs? Your U. S. Royal Dealer has this great tire in your size. Have him put it on your wheels—and prove to yourself why construction men like Mr. Parker report they're *well ahead* with U. S. Royal!

U.S. ROYAL NYLON CON-TRAK-TOR FULL LUG

NOVA SCOTIA OFFICERS—Angus MacDonald, (left), vice president, and S. C. Mifflen, secretary-treasurer, Dominion Coal Co.; D. Brown, National Gypsum (Canada), president; and D. O. Hartigan, Indian Cove Coal Co., vice president.



GYPSUM AND COKE—J. Robt. Cameron (left), National Gypsum (Canada), Ltd.; Angus MacDonald, Dominion Coal Co., Ltd., new institute vice president and session chairman; and J. R. Wallace, Dominion Iron & Steel Co., Ltd.

SAFETY AND PROFICIENCY AWARDS—Left photo, Dr. W. A. Allen, Canadian Institute of Mining & Metallurgy presents regional John T. Ryan Safety Trophy to John C. MacKenzie, Dominion No. 18 Colliery, which previously had won the Dominion Trophy; right photo—W. T. Dauphinee, Nova Scotia Minister of Mines, congratulates Bruce M. Scott, Dominion Coal Co., and Daniel MacNeil, Old Sydney Collieries, Ltd., on their prowess in examinations for mine managers and overmen.

MAINTENANCE, HOISTING, SHIP LOADING, EXPLOSIVES—Wm. Stewart (left), John Laffin and J. A. Russell, Dominion Coal Co., Ltd.; John M. Whatley, Canadian Ingersoll-Rand; and Kenneth M. Ed, Canadian Industries (1954), Ltd.

Mineral Mining, Processing and Shipping Nova Scotia Meeting Themes

INDUSTRY MEETING—
A Special COAL AGE
Staff-Written Report

MINING, shipping and utilization of coal and other minerals, with particular emphasis on the auxiliary operations, such as, maintenance and hoisting, were keynotes of the 68th annual meeting of the Mining Society of Nova Scotia, Keltic Lodge, Ingonish Beach, July 7-9. Official business included the induction of new officers and directors. **Edward D. Brown,** vice president and general manager, National Gypsum (Canada), Ltd., was installed as president, succeeding **Frank Doxey,** assistant general manager, Dominion Coal Co., Ltd. **S. C. Mifflen,** technical assistant to the general manager, Dominion Coal Co., was re-elected secretary-treasurer, and vice presidents were chosen as follows: **Angus MacDonald,** district superintendent, Dominion Coal Co., and **D. Owen Hartigan,** president, Indian Cove Coal Co., Ltd., and a member of the Dominion Coal Board.

Members of the new council are: **H. C. M. Gordon, E. B. Paul, Louis Frost, E. S. MacLean, Harry Hines, R. F. MacKinnon** and **J. A. Russell,** Dominion Coal Co., Ltd.; **W. S. Wilson,** Dominion Steel & Coal Corp., Ltd.; **C. M. Anson,** Dominion Iron & Steel Co., Ltd.; **H. S. Haslam,** Acadia Coal Co., Ltd.; **D. S. Burchell,** Bras d'Or Coal Co., Ltd.; **T. U. Casey,** Nova Scotia Department of Mines; **A. E. Flynn** and **A. E. Cameron,** Nova Scotia Technical College; and **F. S. Jones,** Canadian Industries (1954), Ltd.

Presentation of awards for achievements in safety and for proficiency in college studies and mine examinations were other official institute activities. Honors for highest examination marks went to Bruce M. Scott, Dominion survey department, mine manager's examination; Daniel MacNeil, Old Sydney Collieries, Ltd., overmen's examinations; and Thomas E. Tighe, Jr., Dominion No. 18 Colliery, underground mine manager's. Student awards went to Barnard Thomas Gallant, St. Francis Xavier University, and William A. Clarke, Nova Scotia Technical College. Presentations were made by W. T. Dauphinee, Nova Scotia Minister of Mines.

The regional John T. Ryan Safety Trophy of the Canadian Institute of Mining and Metallurgy was presented to the officials and employees of No. 18 colliery of the Dominion Coal Co., Ltd., by Dr. Walter A. Bell, Geological Survey of Canada and CIM vice president, District No. 1, and was accepted by John C. MacKenzie, No. 18 manager. The Dominion trophy had previously been awarded to No. 18 Colliery, making it 12 out of 13 for collieries of the Dominion Coal Co. and 13 out of 13 for the regional trophy.

COAL IN CANADA

A sober appraisal of coal's present difficulties in Canada, coupled with a note of cautious optimism for the future, was sounded by Mr. Doxey in his presidential address ushering in the technical sessions. Oil and gas development in western Canada, together with railroad dieselization, has resulted in the closing of about half the mines in the area in the past 5 yr. Coal from eastern Canada also has suffered from railroad dieselization and the railroad market probably will be lost completely for Nova Scotia. Residual oil and coal from the U. S. have made it practically impossible for Nova Scotia to compete in the industrial market of central Canada, and further extension of oil and gas lines to the east are a possibility, though it may turn out that natural gas is overrated as a competitor. Hydro potential is still to be exhausted, but atomic power is not a threat in the foreseeable future.

Reviewing briefly the events leading up to the organization of the Dominion Coal Board to encourage mining progress and develop markets, Mr. Doxey pointed out that one result was the development of a mechanization scheme for the collieries of the Dominion Coal Co. Among other things, this involved the design and construction of a continuous machine for longwalling in pitches, starting in 1949. At the end of 1954, 18 of these Dosco miners were in operation and two more will be added in 1955. The results of intensive education and training in the use of the machines is reflected in a steady increase in output and efficiency. One machine, in particular, had completed at the time of the meeting 170 consecutive cuts without breakdown or stoppage, producing 84,000 tons of coal. In 1954, the Dosco machines averaged 5,867 long tons per machine month, compared to 5,511 long tons for British machines, use of which began 13 yr ago. In April, May and June, 1955, average Dosco miner production was 6,024 long tons per month.

Mechanization of longwall mining naturally has been accompanied by improvements in transportation, including new and larger locomotives, heavy track and a 42-in cable-belt conveyor in one new slope, and by the completion of one washery with a capacity of 4,000 tons in 16 hr, with a larger central plant up to 20,000 tons in 16 hr, scheduled for start of construction this fall. On the marketing side, the threat of oil in home heating has resulted in the development of the Dosco downdraft furnace, now being vigorously promoted. An expansion in shipments to Great Britain and Europe can be hoped for in the immediate future, thus helping to tide over the Canadian industry.

Concluding, Mr. Doxey urged that full attention be given to the need for preserving the full potential of Nova Scotia coal output. Costs must be brought down, management must adopt a progressive viewpoint and encourage the development of ideas, and those concerned with distribution and market development must support and encourage the use of coal.

Developing the theme of cautious optimism, M. G. Goudge, chief mining engineer, Nova Scotia Department of Mines, in a review of all mineral industry activities in Nova Scotia, noted, that in spite of difficulties, Nova Scotia coal production in 1954 was approximately 50,000 tons higher than in 1953.

COKE IN CAPE BRETON

Development of the new National Gypsum quarry in Nova Scotia was detailed by J. Robt. Cameron to start off the second session, presided over by Mr. MacDonald. Following Mr. Cameron, J. R. Wallace, for himself, E. P. Duchemin and Wm. Snow, Dominion Iron & Steel Co., Ltd., discussed "Metallurgical Coke in Canada, With Particular Reference to Coke From Cape Breton Coals." Compared to coke from Nova Scotia coal, that produced in Ontario by blending coals from the U. S. is higher in strength, somewhat higher in ash, considerably lower in sulphur and lower in by-product yields. Attempts to improve the structure of coke from Cape Breton coals resulted in the installation of an experimental oven in 1944, using as criteria the ASTM shatter and tumbler (stability) tests. Results included the following:

1. Finer crushing improved structure and increased both index numbers.
2. Washing had little effect on shatter but considerably improved stability.
3. There was some variation in coke strength with coals from the different seams, the Phalen proving somewhat superior and the Harbour the weakest.
4. Crushing to minus ⅛ in improved coke strength.
5. Blending in low-volatile coal from the U. S. raised coke strength materially.
6. Blending in coal from certain other company mines also increased strength but about twice the quantity was necessary for the same improvement.

MINE MAINTENANCE

"It is no longer sufficient to maintain an organization that can repair a broken machine in an astonishingly short time. The machine must not break down at all."

(*Continued on p 150*)

Among the Manufacturers

Timken Shifts Four

S. C. Partridge, general manager, Timken Roller Bearing Co., has announced that R. L. Williams, district manager of the company's St. Thomas, Ont., office, has been named district manager at a newly established Columbus, Ohio, office; B. C. Price has been made district manager at St. Thomas; and L. H. Gegenheimer, assistant district manager in Cleveland, Ohio, has been named district manager to replace J. W. Weir, who has retired. D. O. Scheetz, field engineer, will remain in Cleveland to assist Mr. Gegenheimer.

Heyl & Patterson Appoints

Edward H. D. Gibbs, vice president-sales, Heyl & Patterson, Inc., Pittsburgh, Pa., has announced the appointment of Ellis J. O'Brien as manager, standard product sales. Mr. O'Brien joined Heyl & Patterson in 1952 and had been chief development engineer for the company. Previously, he was associated with the Vanadium Corp. of America as a process metallurgist both in the United States and South America.

Ludlow-Saylor Advances Three

Virgil R. Hogan and Robert E. Draper have been named as representatives for Ludlow-Saylor Wire Cloth Co., St. Louis, Mo., Ernest Robson, sales manager, has announced. Mr. Hogan will make Birmingham, Ala., his headquarters, covering the states of Alabama, Florida, Georgia, eastern Kentucky, Mississippi and central Tennessee. Mr. Draper will cover Texas and Louisiana from Houston, Tex. William E. Gould has been appointed vice president and general manager of Star Wire Screen & Iron Works, Inc., Los Angeles, a subsidiary of Ludlow-Saylor Wire Cloth Co., with which Mr. Gould has been associated for 16 yr as a sales engineer.

Joy Names Felderman

Joy Mfg. Co. has appointed L. G. Felderman sales manager, rock mechanization, with headquarters at the company's Franklin, Pa., plant. He formerly was manager, sales engineering, for all Franklin products. In his new position, Mr. Felderman will specialize on trackless mining products for hard rock and tunnel applications. Mr. Felderman had also served as chief inspector, purchasing agent and field engineer since joining Joy's engineering department in 1930.

ACF Advances Two

Ellsworth B. Carpenter, formerly western sales manager, American Car & Foundry Div., ACF Industries, Inc., has been appointed vice president-sales, with headquarters in St. Louis, Mo., according to an announcement by Samuel M. Felton, president of the division. Mr. Carpenter joined ACF at Berwick, Pa., in 1927 and was transferred to St. Louis in 1928. He became district sales manager in 1940 and western sales manager in 1954. John E. Angst, district sales manager for the division, has been appointed vice president-sales, with headquarters in Chicago. Mr. Angst joined the ACF sales staff as a sales agent in the New York office in 1945 and was transferred to Chicago in 1948.

U. S. Rubber Ups Reid

Appointment of Herbert J. Reid as assistant general manager, Mechanical Goods Div., United States Rubber Co., has been announced. Mr. Reid was formerly factory manager of the division's Fort Wayne, Ind., plant. Homer O. McCracken, assistant factory manager, has been named to succeed Mr. Reid. In his new post, Mr. Reid from headquarters in New York will have responsibility for supervising production and research as well as sales operations in the mechanical goods division.

Daniels Co. Adds Dunn

Gordon H. Dunn has joined The Daniels Co., Contractors, Inc., Indiana, Pa., as design engineer, H. J. Daniels, president of the firm, has announced. Mr. Dunn will operate in western Pennsylvania and West Virginia. He was formerly engineer on the staff of Roberts & Schaefer Co., Chicago.

Simplex Transfers Stoddard

In a move designed to strengthen its home office engineering staff, Simplex Wire & Cable Co., Cambridge, Mass., has announced the transfer of Henry R. Stoddard from its Chicago office. With the company for 28 yr, Mr.Stoddard has had wide experience in cable engineering and user problems in the Midwest for 17 yr.

Stearns Magnetic Appoints

Keith G. Splude has been named divisional sales manager, Brake Div., Stearns Magnetic, Inc., Milwaukee, Wis., R. N. Stearns, the firm's executive vice president, has announced. Mr. Splude, formerly an application engineer with the Louis Allis Co., Milwaukee, will be responsible for sales and service of the company's complete line of magnetic brakes and small clutches.

Marion Names District Heads

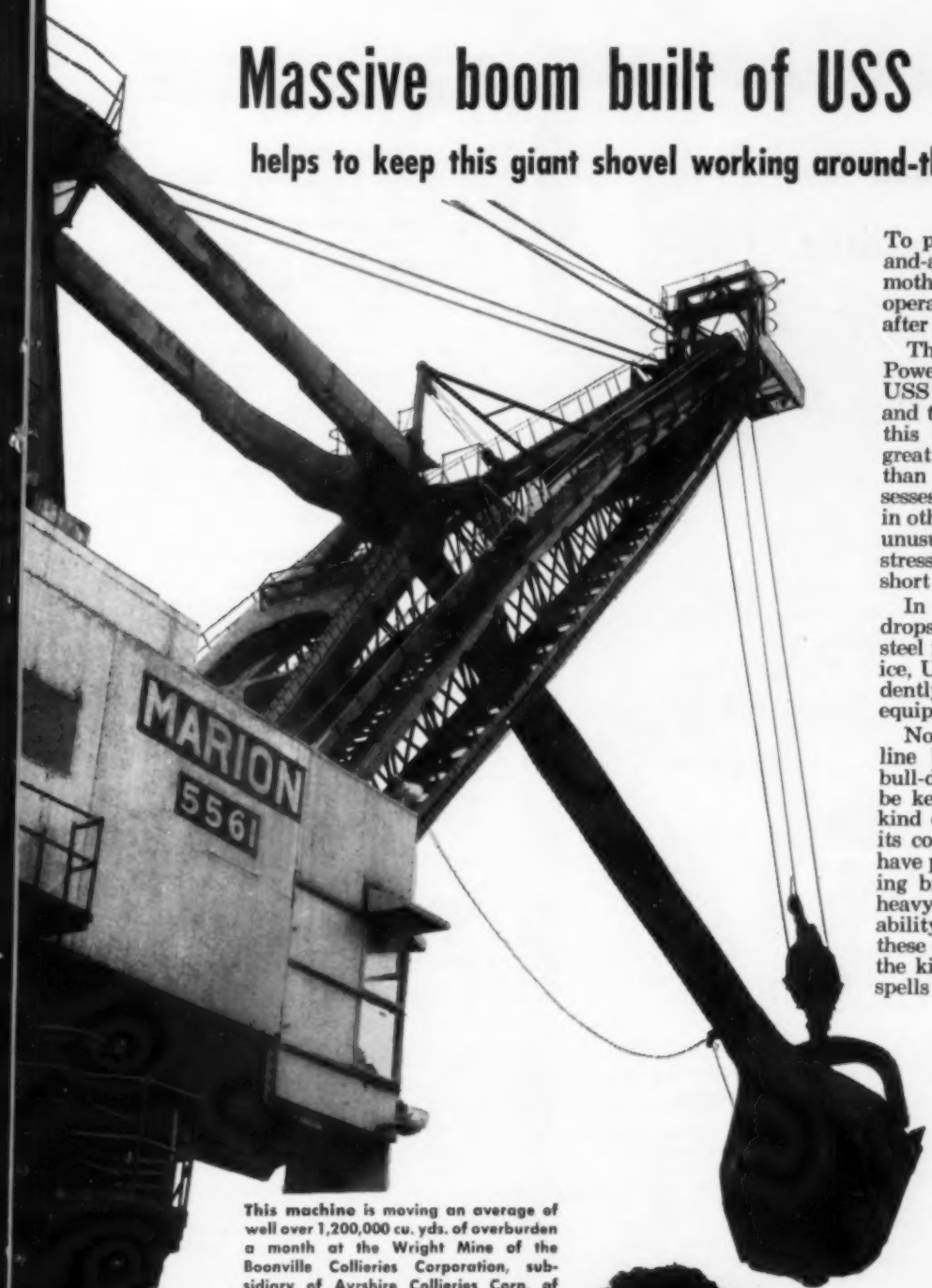
Marion Power Shovel Co., Marion, Ohio, has appointed Walter Pierson southeastern sales manager. He will make his headquarters at the company's new district office and warehouse at Unit 19, Bldg. E, 650 Murphy Ave., S. W., Atlanta, Ga. The MPS district office was formerly located in Birmingham, Ala. In his new post, Mr. Pierson will be responsible for the promotion of MPS machines in South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi, Louisiana and parts of Arkansas. He will be assisted by R. S. Rheay, divisional sales manager at the Atlanta office. The company also appointed Paul Fenwick as its northeastern sales manager, with headquarters in New York. In his new post, Mr. Fenwick will be responsible for the sales in the New England states, New York, New Jersey, Delaware and the eastern half of

Coal Age Appoints Lange, Patten

J. E. LANGE (left) has been named Cleveland district sales manager for *Coal Age* and *Engineering and Mining Journal*, succeeding W. M. Spears who is retiring Sept. 1. John W. Patten (right) has been appointed New England district manager for the two publications, succeeding John B. Lewis, who now is district manager, Philadelphia. For the past two yr Mr. Lange has been Western district direct-mail representative for the McGraw-Hill Publishing Co. in Chicago. Prior to joining McGraw-Hill, he was with Pickands Mather & Co., Cleveland, in safety, public and personnel relations work. Mr. Lange is a graduate of Denison University. For the past 18 mo Mr. Patten has been the Chicago district manager of the Classified Div., McGraw-Hill Publishing Co. He has served with the U.S. Air Force and is a graduate of Dartmouth College.

Massive boom built of USS TRI-TEN Steel

helps to keep this giant shovel working around-the-clock all year 'round



This machine is moving an average of well over 1,200,000 cu. yds. of overburden a month at the Wright Mine of the Boonville Collieries Corporation, subsidiary of Ayrshire Collieries Corp. of Indianapolis, Ind.

To pay off on the more than a million-and-a-half dollars invested in this mammoth 45-cu. yd. power shovel it must operate *continuously*—24 hours a day, day after day, every month in the year.

That's why the engineers of the Marion Power Shovel Co., Marion, O., selected USS TRI-TEN Steel for all plates, angles and tees in the massive 120 ft. boom. For this tough, versatile steel not only has great strength—a 50% higher yield point than carbon steel—but in addition possesses an important advantage well proved in other similar construction . . . it has the unusual ability to withstand shock and stress at sub-zero temperatures. Here in short is a true *all-weather* steel.

In other words, when the thermometer drops to the point where a less efficient steel might tend to crack and fail in service, USS TRI-TEN construction can confidently be depended upon to keep the equipment profitably on the job.

Not only in booms like this, but in drag line buckets, heavy-duty truck frames, bull-dozers and power shovels that must be kept working hour after hour in any kind of climate, USS TRI-TEN Steel and its companion, USS TRI-TEN "E" Steel, have proved their superiority by minimizing breakdown hazards. In hundreds of heavy-duty applications, where dependability is of prime importance, the use of these high strength steels has resulted in the kind of uninterrupted operation that spells bigger output at lower cost.

NOW AVAILABLE . . . Our new "Design Manual for High Strength Steels" is ready for distribution. This 174-page book is free. It contains comprehensive and practical information that you will find extremely useful in designing your equipment for greater economy and efficiency by the sound use of high strength steels. For your copy, write on your company letterhead giving your title or department, to United States Steel Corporation, Room 4864, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

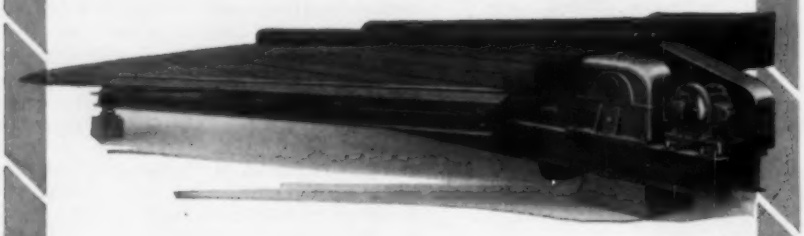
USS HIGH STRENGTH STEELS

5-1834

USS TRI-TEN • USS COR-TEN • USS MAN-TEN

UNITED STATES STEEL

Step-Up Washed Coal Profits with *SuperDuty*® Tables



The net advantage in cleaning coal is measured not only by tonnage per day but by how well the job is done. The plant equipped with SuperDuty DIAGONAL-DECK® Coal Washing Tables is therefore at an advantage because the SuperDuty combines highly satisfactory tonnages with optimum product quality and minimum loss to the refuse.

This performance is welcomed by both large and small producers. Whether they employ a single unit or a large battery, the efficiency is exactly the same. For their operating dollar, the SuperDuty produces more tons of premium washed coal than any other process employed on the fine sizes today. For full information, ask for Bulletin 119.

CONCENCO®
FEED DISTRIBUTOR

While unexcelled for feeding coal washing tables, the CONCENCO Revolving Feed Distributor effectively provides a splitting of feed, into any desired number of equal portions, to accurately feed circuits or machines in battery for their greater overall efficiency. It is a heavily fabricated all steel machine with motor drive requiring 1 H. P. or less in operation.

THE DEISTER ★
CONCENTRATOR
COMPANY
923 Glasgow Ave. • Fort Wayne, Ind., U.S.A.
CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

Pennsylvania. In eastern Pennsylvania and upper New York, he will be assisted by Edward R. Gee, divisional sales manager.

Vickers Elects Officers

E. A. Pierce, chairman of the board of Vickers, Inc., Detroit, Mich., has announced the election of the following officers: Harry F. Vickers, vice chairman of the board; Kenneth R. Herman, president; and Dr. N. E. Edlefson, vice president for engineering. Mr. Vickers is the founder of Vickers, Inc., and also is president of Sperry-Rand Corp., of which Vickers is a subsidiary. Mr. Herman, who joined Vickers in 1931, is a vice president of Sperry-Rand Corp. and formerly was vice president and general manager of Vickers. Prior to joining Vickers, Dr. Edlefson was associated with North American Aviation, Inc., which he joined in 1947.

Westinghouse Automates Factory

A new Westinghouse Electric Corp. manufacturing plant, described as "the most highly automatic of any of the company's plants," is reportedly under construction at Youngwood, Pa. It will employ between 400 and 500 people by the end of 1956, according to Bruce D. Henderson, Westinghouse vice president. It will be devoted to the manufacture of semi-conductor devices such as transistors, power rectifiers, high frequency detectors and photocells, and will be operated by the company's newly-formed semi-conductor department. Manager of the new department and plant will be L. R. Hill. Other key appointments announced include: Dr. S. J. Angello, manager of engineering; Dr. L. L. Friend, manager of manufacturing; W. L. James, manager of sales; and C. H. Hildebrand, purchasing agent.

GM Powerama Scheduled

A large outdoor exposition portraying the dramatic contribution of diesel and aircraft power to America's industrial economy will be staged by General Motors on Chicago's lakefront Aug. 31 through Sept. 25, Harlow H. Curtice, president of General Motors, has announced. The "General Motors Powerama" will be open to the public in a 1,000,000-sq ft area on S. Lake Shore Dr., adjacent to Soldier Field. This was the site of the Century of Progress exposition in 1933-34. Admission to the 26-day "world's fair of power" will be free. Entertainment on the colorfully decorated Powerama grounds will range from stage shows with singing and dancing to exhibits showing actual operation of the modern locomotive, saw mill, cotton gin, earth mover, fighter plane and many other mechanical giants. Top stars of the Powerama will be such big members of the GM family as dump trucks, locomotives, scrapers, tractors, boats and a variety of engines and other equipment.

GC Adds Three Plants

General Cable Corp. has contracted to acquire General Insulated Wire Works, Inc., Providence, R. I., according to an

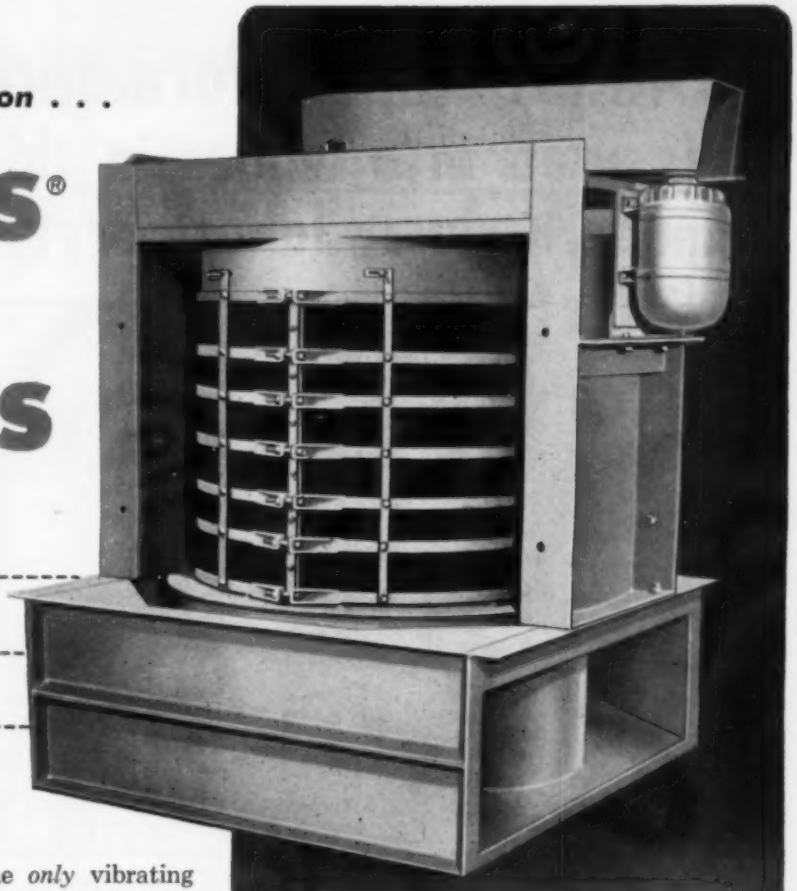
for better Coal Preparation . . .

SYMONS® "V" SCREENS

. . . FOR DEWATERING

. . . FOR SIZING

. . . FOR DEDUSTING



The SYMONS V-SCREEN is the *only* vibrating screen that does not depend upon gravity alone to size or dewater. By combining centrifugal force with gravity, the V-Screen does a better screening job—makes sharper separations—gives you a much dryer product with less degradation than other dewatering methods . . . and requires only 5 H.P. to operate under full load.

The capacity of the Symons V-Screen is over twice that of a conventional type vibrating screen, per square foot. In addition, its new screening principle gives extremely long screen cloth life.

Mail the coupon for full details.

NORDBERG MFG. CO., Milwaukee, Wis.

PROVED IN SERVICE . . .

Here are just two examples of Symons V-Screen performance in coal preparation service:

(1) Feeding V-Screens up to 65 tph of ⅝" x ⅛" bituminous coal getting product with surface moisture below 4%. Surface moisture reduction of over 60%—practically no degradation—little screen cloth wear. (2) Several V-Screens dewatering ⅛" coal . . . reducing surface moisture by at least 50%—very little degradation.

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

NORDBERG MACHINERY

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SYMONS SCREENS NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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OTHER SYMON SCREENS

Symons Horizontal Screens

Symons Bar Grizzlies

Symons Rod Deck Screens

Symons Rod Grizzlies

MAIL THIS COUPON TODAY

NORDBERG MFG. CO.
Milwaukee, Wis. CA

Please send me a copy of the new Bulletin 243, just off the press, giving complete information about the Symons V-Screen.

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

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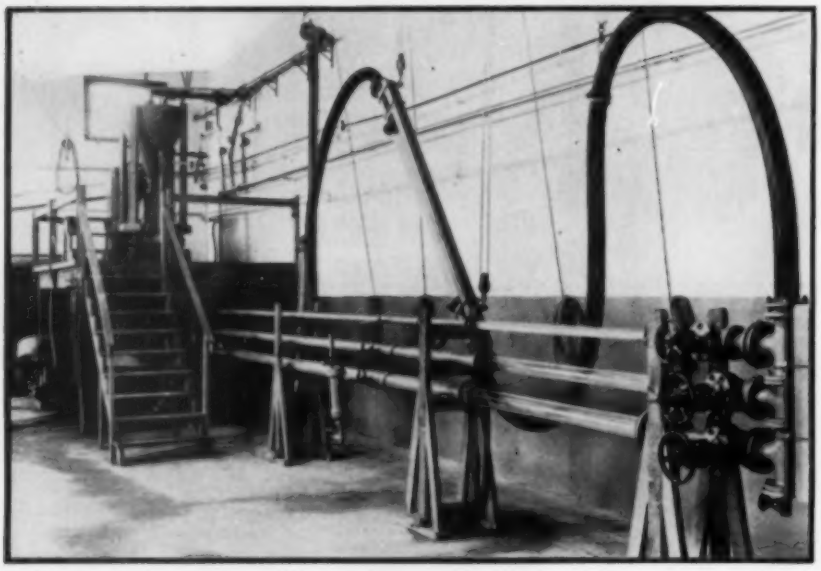
MORRIS Pump Performance is *insured in advance* in this modern slurry laboratory!



The Morris equipment testing slurry shown here can determine friction losses and critical carrying velocities of any slurry. Customers' samples analyzed here have taken much of the guesswork out of slurry applications, and yielded such answers as these to actual pumping problems:

ANSWER	1	Proved that a job originally estimated at 200 HP could be done easily with 60 HP — because of very low critical carrying velocity and unusually low friction loss.
ANSWER	2	Proved wide friction differences in very similar materials — saving the customer the time, expense and possible loss of an inadequate pump.
ANSWER	3	Proved that the customer could handle the job by gravity alone — and so required no pumping equipment at all!

GOT A SLURRY PUMPING PROBLEM? For quick action, get in touch with the Morris engineers. The answers turned up by the Morris Slurry Laboratory may be just as pleasantly startling as any of the three above. If the pipeline is long, the Morris laboratory may give you the answer for minimum friction loss. A Morris-engineered installation is your best bet for economical, trouble-free service.

MORRIS CENTRIFUGAL PUMPS

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Sales Offices in Principal Cities

announcement by I. T. Bennett, chairman of the board, and J. R. MacDonald, president of General Cable Corp. With this plant, General Cable adds a new line of products to include rubber, neoprene and plastic power supply cords with molded-on rubber or plastic attachment plugs and devices, electrical cord sets, bulk lamp cords and portable power cords. C. J. Craig, president of General Insulated Wire Works, will be appointed a vice president of General Cable, with principal responsibility for the Providence operation. Another new facility involves the construction of a modern, new plant in Monticello, Ill. "This new manufacturing facility will increase General Cable's production of paper telephone cable by approximately 25%," Mr. MacDonald said.

Rockbestos Corp. Acquired

Consolidated Coppermines Corp. has acquired a controlling interest of approximately 84% in Rockbestos Products Corp., New Haven, Conn., through an exchange of stock. The acquisition of Rockbestos permits Consolidated Coppermines to add wire and cable manufacturing to its copper mining and metal fabrication operations. Consolidated Coppermines also owns a controlling interest in The Titan Metal Mfg. Co., Bellefonte, Pa., manufacturer of brass and bronze products. It is intended to continue to operate Rockbestos as a separate company under its present name, and long range plans call for expanding the Rockbestos operations, Chester D. Tripp, president of Consolidated Coppermines, said.

Stewart-Warner Buys Firm

An agreement has been signed between Stewart-Warner Corp. and John W. Hobbs Corp. for the purchase by Stewart-Warner of the entire business and assets of Hobbs, whose headquarters and manufacturing plants are located at Springfield, Ill. The Hobbs Corp. produces specialty electrical devices for the automotive and related industries.

Bristol Promotes Nuber

Ernest Nuber has been promoted to general field sales manager for The Bristol Co., according to an announcement by Harry E. Beane, vice president in charge of sales. Mr. Nuber joined the Bristol sales engineering organization in 1929. He was made Pacific Coast manager in 1934 and later became export manager. In 1948 he was promoted to manager of the company's application engineering department and has been sales manager since 1954.

Koppers Names Official

Dr. Walter C. Rueckel, formerly vice president, Henry J. Kaiser Co., Oakland, Calif., has been elected vice president and general manager, Engineering and Construction Div., Koppers Co., Inc. In making the announcement, Fred C. Foy, Koppers president, said that Dr. Rueckel, who left Koppers in 1951, now returns to fill the vacancy created by the death in an auto accident of George M. Carvlin. Dr. Rueckel originally joined Koppers in 1935 and was appointed a vice president

Now...load rate your bearings at higher values

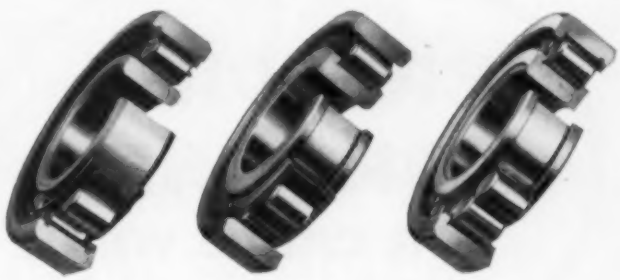
with Tru-Rol CROWNED ROLLERS

Greater capacity . . . longer life . . . or a precisely balanced gain of *both* factors. That is the choice offered you by the "crowned" rollers of Tru-Rol bearings.

By finish grinding a carefully selected crown radius on roller ends, Rollway relieves high stress areas, insures uniform distribution of load over the entire length of the roller. Rollers can take heavier loads without excessive end-fatigue, and are less subject to the effect of slight misalignment or deflection.

The result is load rating at higher values for greater capacity, longer service life . . . or both. If this choice interests you, why not write for the complete story. Rollway Bearing Co., Inc., Syracuse, N. Y.

Tru-Rol Bearings with crowned rollers are available in 3 types

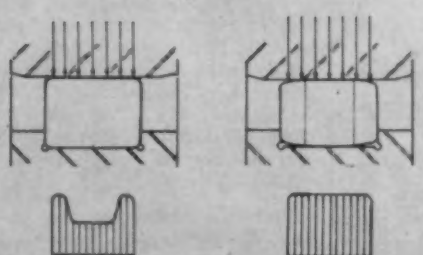


Stamped Steel Retainer with Guide Lips

Segmented Steel Retainer

Full Roller

Comparative Stress Patterns under Uniform Loads for Straight and Crowned Cylindrical Rollers



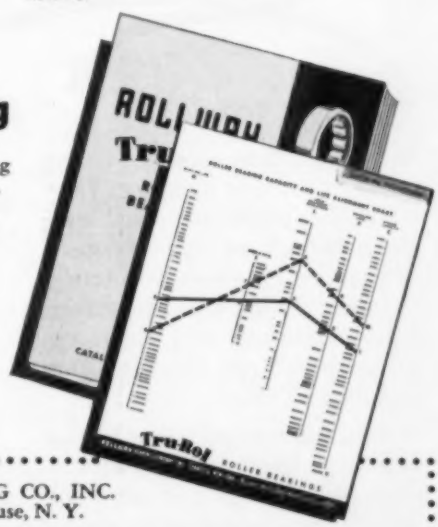
Stress pattern for a straight cylindrical roller under load. Note uneven end-loading.

Stress pattern for crowned roller under load. Crowning radius is exaggerated for clarity.

FREE New Catalog

features RBEC* bearing selection formula converted to simple nomograms! Send for a copy today.

*Roller Bearing Engineers' Comm. — Anti-Friction Bearing Mfrs. Assn.



ROLLWAY BEARINGS

COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARINGS

ROLLWAY BEARING CO., INC.
563 Seymour St., Syracuse, N. Y.

Please send free copy of your new Tru-Rol Catalog with extra Alignment Charts.

Name_____ Title_____

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ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronto • Pittsburgh • Cleveland • Milwaukee • Seattle • Houston • Philadelphia • Los Angeles • San Francisco

BREEDING GROUND FOR CABLE WEAR

Everywhere these shovels go, their power cables have to follow. There are enough jagged edges and abrasive surfaces in any open pit operation to quickly tear cable coverings to shreds. To cut down on upkeep, mine maintenance men everywhere are using Ruberoid Insulating Tape to protect all electric cables.

Ruberoid Insulating Tape is made of a tough fabric saturated with asphalt. Adhesive on both sides provides the strongest possible grip that won't tear or ravel. It's acid and alkali proof and extra thick so that one layer gives the maximum in protection and insulation.

Ruberoid Insulating Tape exceeds A.S.T.M. specifications by 40% in adhesiveness, 25% in tensile strength and 110% in dielectric strength. No wonder it's a superior cable covering. Keep your cable maintenance to a minimum by specifying Ruberoid Insulating Tape for *all* electric cables.

For further information, write The Ruberoid Co., 500 Fifth Ave., New York 36, N. Y.

The RUBEROID Co.

ASPHALT AND ASBESTOS BUILDING MATERIALS

in the Koppers Div. in 1947, with special responsibility for supervision of relations with customers in South America.

Lincoln Advances Jenkins

Joseph J. Jenkins has been appointed sales manager, Industrial Div., Lincoln Engineering Co., St. Louis, Mo. Prior to his new post, Mr. Jenkins served as national service manager in the plant service dept. and as assistant to the industrial sales manager.

A-C Appoints Stewart

A. L. Stewart has been named Allis-Chalmers regional representative for crushing cement and mining industries, with headquarters in Cleveland, Ohio, R. L. Halsted, manager of the firm's central region, has announced. Mr. Stewart joined Allis-Chalmers in 1942 and has been a representative in the Cleveland district office since 1949.

And For Your Information . . .

Grant Wheat, 71, inventor of the Wheat electric cap lamp, suffered a fatal heart attack on June 17 in Denver, Colo. Mr. Wheat, a native of New York State, was a director of Koehler Mfg. Co. with which he was associated for 38 yr. He held numerous U. S. and foreign patents covering his inventions in mine lighting. At the time of his death, he was still active in his efforts to improve the Wheat lamp, of which there are over 800,000 in daily service throughout the world.

John B. Davies, manager of industrial sales, Mine Safety Appliances Co., Pittsburgh, has been elected president of the Industrial Safety Equipment Association. Mr. Davies is a graduate of Carnegie Institute of Technology. He joined MSA as a chemist in 1919, 5 yr after the company was founded, and before assuming his present position, was assistant sales manager.

Sharples Chemicals, Inc., July 1 became an operating division of the Pennsylvania Salt Mfg Co., President William P. Drake has announced. Sharples was acquired by Pennsalt Chemicals through an exchange of stock in 1951. Its operations will continue without change under the direction of Lee H. Clark, general manager.

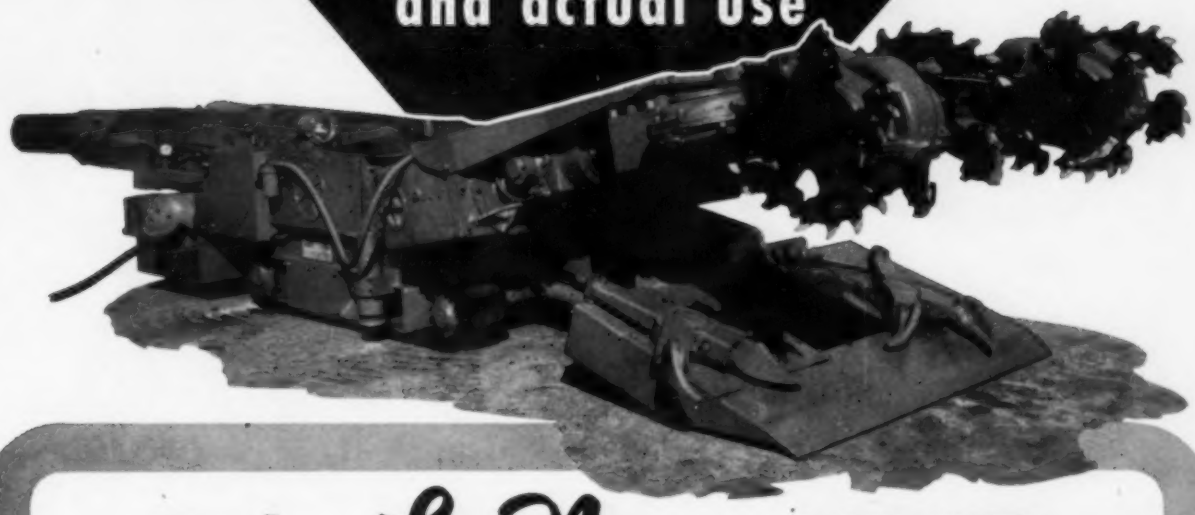
ACF Industries, Inc., has announced that the directors of Key Co., East St. Louis, Ill., has approved an offer by ACF to purchase the assets of the Key Co. The offer was scheduled to be submitted to a special meeting of stockholders of Key Co. in August.

Worthington Corp. has moved its Midwest Regional Engineering & Service Div., from 400 W. Madison St., to 6124 North Pulaski Rd., Chicago. The division will be under the direction of L. R. Dise, manager. The Chicago district sales office, under the direction of W. C. Cheek, manager, will continue at 400 W. Madison St.

Kenneth Adams Jr., Atlanta, Ga., has been named regional sales manager in the southeast for the Carver Pump Co. He will work with distributors in

Lee-Norse MINER

Tried and proved by years of development and actual use



Only Lee-Norse MINER

1. Provides practical pattern cutting.
2. Uses a simplified rotary cutter.
3. Cuts its way steadily forward into the face without swinging the cutter head.
4. Has a gathering head that performs maximum cleanup — no auxiliary loading equipment necessary.
5. Produces coarse cuttings from diamond-like projections—fines are held to a low minimum.
6. Requires no additional or elaborate power facilities.
7. Combines the best features of modern loading machine designs with the unique principle of "pattern cutting".
8. Is produced by an organization with an enviable record of outstanding achievement in the field of mining equipment design and production.

Write today for literature:

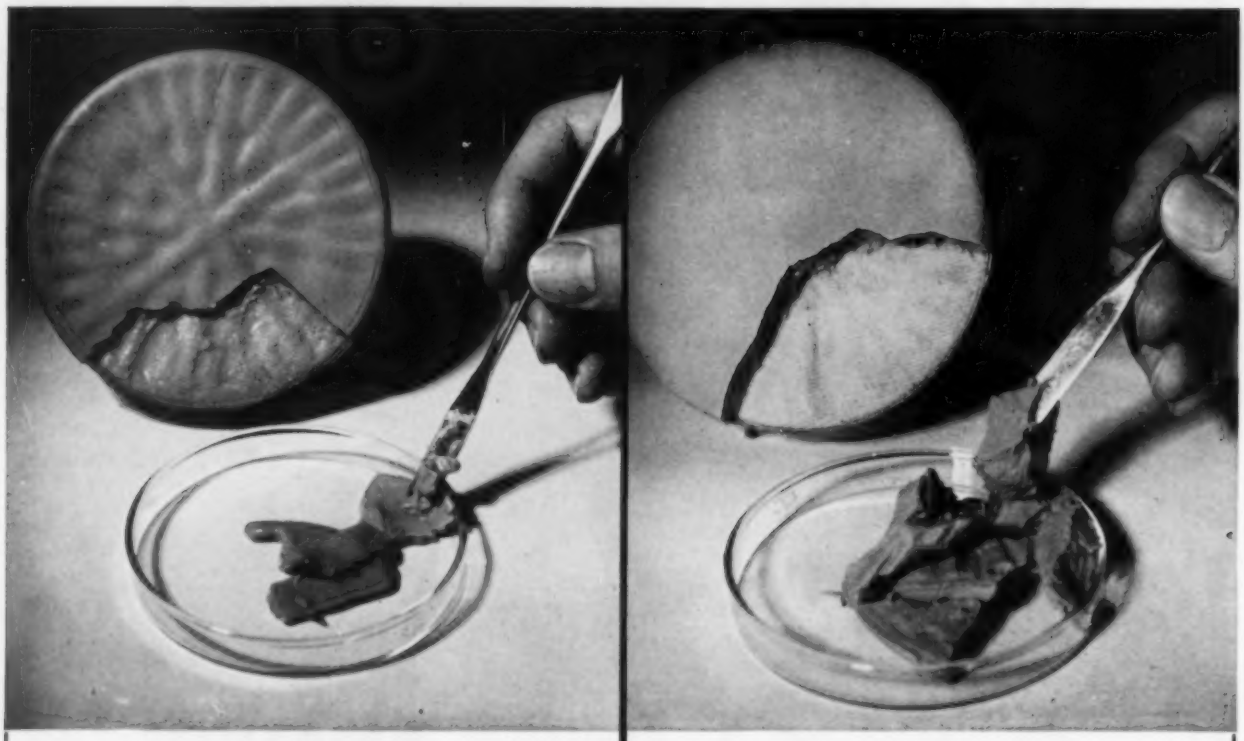
Lee-Norse Company

Specialists in Coal Mining Equipment

CHARLEROI, PA.

Separan 2610

GREATLY IMPROVES FILTRATION



Above picture shows thin cake formed on filter with untreated solids. Cycle includes 15-second cake formation and 45-second drying time.

During the same cycle, a much thicker cake is formed by treating with 0.15 lb. of SEPARAN 2610 per ton of dry solids present.

New flocculating agent speeds up filtration and settling rates, brings many other improvements to liquid-solid separations

THE DOW CHEMICAL COMPANY
Dept. TS-789F-1, Midland, Michigan

Please send me information and a trial sample of SEPARAN 2610.

Name_____

Company_____

Address_____

City_____ State_____

Prove to yourself the advantages of Separan* 2610 in filtration.

1. Increased cake size
2. Decreased cake moisture and better washability
3. Easy to handle and less dusty cake
4. Less material loss in filtrate
5. Effective over wide pH range

Prove to yourself the advantages of Separan 2610 in settling.

1. Up to 40 times faster settling rate
2. Increased overhead clarity
3. Less materials loss in overhead
4. Reduced cost in acid and alkaline media
5. Increased plant capacity

SEPARAN 2610 is highly effective in these industries:

- Uranium
- Clay
- Borax
- Cement
- Alum
- Potash
- Foundry Sand
- Coal
- Phosphoric Acid
- Iron Ore and Taconite
- Industrial Water, and Waste
- Miscellaneous Metals

*Trademark of The Dow Chemical Company

you can depend on DOW CHEMICALS

DOW

Georgia, Florida, Alabama, Tennessee, North and South Carolina.

Huber-Warco Co., Marion, Ohio, has appointed Euclid-Arkansas, Inc., 702 W. Second St., N. Little Rock, Ark., and Foulger Equipment Co., 1361 S. Second West, Salt Lake City, Utah, as distributors of its complete line. Euclid-Arkansas, Inc., will soon move into its new modern home at 711 Parker St., Little Rock, Ark.

McDowell Co., Cleveland, Ohio, has appointed H. Kleinhans Co., Pittsburgh, Pa., as sales representative in western Pennsylvania for all of its enterprises. These include the Dwight-Lloyd Div.; The Wellman Engineering Co.; and the Williams Bucket, Locomotive Crane, and Anker-Holth Div. of Wellman.

Donald J. Beach will cover Michigan, Indiana and western Kentucky for Flexible Steel Lacing Co., manufacturers of Flexco and Alligator belt fasteners and REMA rubber repair materials for conveyor belts.

Industrial Equipment Co., Joplin, Mo., has been named an authorized Carboloy carbide tool distributor by the Carboloy Dept., General Electric Co., Detroit, Mich. The Missouri firm will carry Carboloy's line of standard and special carbide metal cutting tools, as well as its masonry drills and diamond grinding wheel dressers.

Preparation Facilities

Reilly Contracting Co., Wiconisco, Pa.—Contract closed with Wilmot Engineering Co. for one 2½-ft Wilmot cone cleaner for preparation of barley coal; feed capacity, 15 tph.

M. A. Hanna, Susquehanna Colliery Div., Glen Lyon, Pa.—Contract closed with Wilmot Engineering Co. for one 7-ft diameter Wilmot cone cleaner for preparing buckwheat No. 1 coal; feed capacity, 100 tph.

John G. Connell Coal Co., Shaft Operation, Hazleton, Pa.—Contract closed with Wilmot Engineering Co. for one 16-ft diameter Wilmont classifier cleaner for No. 5 coal; feed capacity, 100 tph.

Blaschak Mining, Ringtown, Pa.—Contract closed with Wilmot Engineering Co. for one Wilmot heavy-media system with one No. 526 Wilmot-OCC HM separatory vessel for preparing R-O-M anthracite from 3¼- to plus $^{3}/_{16}$-in size; feed capacity, 50 tph.

Live Oak Coal Co., Minersville, Pa.—Contract closed with Wilmot Engineering Co. for one Wilmot heavy media system with one No. 526 Wilmot-OCC HM separatory vessel for preparing R-O-M anthracite 3¼- to plus $^{3}/_{16}$-in size; feed capacity, 100 tph.

Dennis K. Pickens, Shaft Operation, Hazleton, Pa.—Contract closed with Wilmot Engineering Co. for one No. 606 Wilmot-OCC HM separatory vessel for use in HM system designed to prepare

introducing
NEW Hendrick Wedge Wire
Now! With the addition of new Hendrick Wedge Wire, Hendrick rounds out its line of screens for the best in efficient, low-cost screening, de-watering and filtering operations. Hendrick Wedge Wire is ideal wherever it's important for screen openings to be minutely fine, have excellent draining qualities and a high degree of accuracy and rigidity. For details on Wedge Wires free clearance, rugged mechanical and lateral strength, maximum load carry capacity, percentage open area and long wearing life, call Hendrick, today!
Hendrick
MANUFACTURING COMPANY
41 Dundaff Street, Carbondale, Pa.
Sales Offices in Principal Cities

NEW LIGHT-WEIGHT HIGH-SPEED CORE DRILLING MACHINES

SKID MOUNTED

For jobs not easily accessible by truck or trailer.

Wide structural steel base and low center of gravity assure maximum stability. Powered by either gasoline or Diesel engines; air or liquid cooled.

IDEAL for coal testing or any other kind of diamond drilling up to moderate depths.

Modern simplified design includes machine-cut alloy-steel gears, anti-friction bearings and other improved features to assure low-cost trouble-free operation. Backed by more than seventy years of world-wide experience in all types of diamond drilling.

Complete information furnished promptly on request. Get our prices, also, on Oriented Diamond Bits and all other accessory equipment for Diamond Core Drilling and Soil Sampling.

TRAILER MOUNTED

For easy portability without tying up a truck. Also complete truck-mounted units with 4-wheel drive.

SPRAGUE & HENWOOD, INC.
SCRANTON 2, PENNA.
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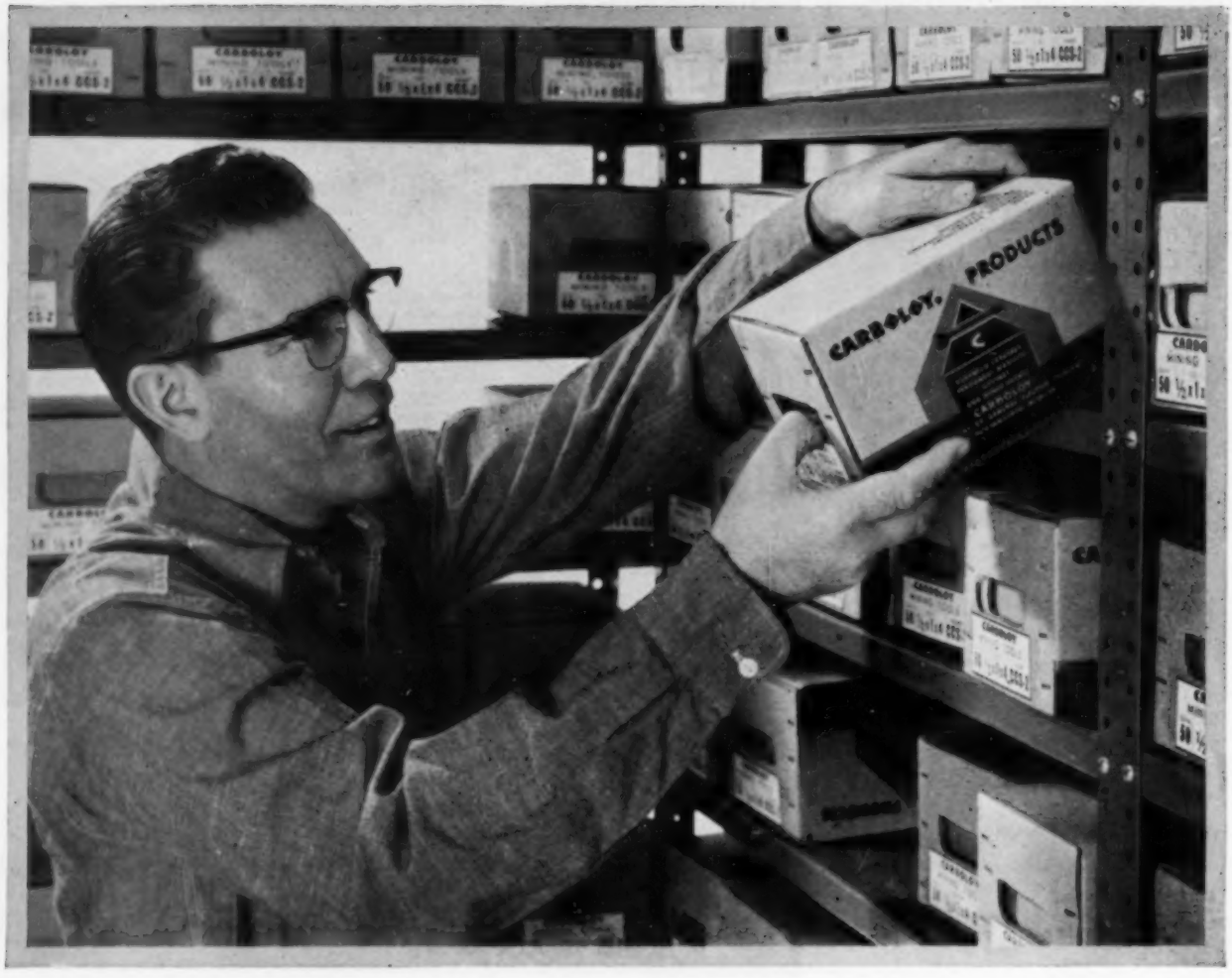

Don't tie up money in mining-tool inventory . . .

Use your Carboloy Distributor's local stockroom as your own

When you use Carboloy® Mining Tools, you save money *above* ground, as well as *below*. Carboloy Mining Tool Distributors save you the cost and problems of maintaining large tool inventories.

Whenever you need new stocks, they're as near as your phone. Your local Carboloy Distributor will give you immediate delivery on any tool in the complete Carboloy line.

And at the face, you'll find Carboloy carbide Mining Tools save still more. They cut 20%-30% more coal per shift than steel tools. They reduce power consumption, and outlast steel up to 50 times.

Your local Authorized Carboloy Distributor is listed on the opposite page. Use his stocks as your own; ask him for assistance on carbide mining-tool applications.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11120 E. 8 Mile Street, Detroit 32, Michigan

Carboloy Created-Metals for Industrial Progress

commercial sizes of anthracite from refuse bank; feed capacity, 175 tph.

Sloss-Sheffield Steel & Iron Div., U. S. Pipe & Foundry Co., Bessie mine, Maben, Ala.—Contract closed with The Daniels Co., Contractors, Inc., for a complete coal preparation plant, including a DMS dense media washery, froth-flotation cells, and seven Deister No. 7 SuperDuty Diagonal-Deck coal washing tables for handling pre-classified bituminous feeds, 65 tph, ⅛-in x 20-mesh, and one 8-cell Concenco SuperSorter for handling 116 tph of 3/16x0 primary feed.

Colmac Coal Co., Hazleton, Pa.—Contract closed with the Western Machinery Co. for a Wemco Mobil-Mill to treat 3 x 3/16 in; feed capacity, 200 tph.

Hackers Creek Coal Co., Buckhannon mine, Upshur County, W. Va.—Contract closed with Deister Concentrator Co. for two No. 7 SuperDuty Diagonal-Deck coal washing tables for treating 1x0 bituminous coal. Feed capacity 25 tph.

Jeddo Highland Coal Co., Jeddo, Pa.—Contract closed with Deister Concentrator Co. for one No. 6 SuperDuty Diagonal-Deck coal washing table for treating No. 5 buck anthracite.

Pittsburgh Consolidation Coal Co., Cleveland, Ohio—Contract closed with Fairmont Machinery Co. for a complete coal dewatering and drying plant. Capacity 150 tph of 14-mesh x 0 coal pumped through a pipe line on the basis of 50% concentration of solids by weight. Major equipment consists of four 10-ft 6-in diameter, 13-disc vacuum filters, four 16-ft Raymond flash dryers, two 90-ft thickeners, one 85-ft flocculator and auxiliary equipment.

Leechburg Mining Co., Foster mine, Leechburg, Pa.—Contract closed with the Daniels Co., Contractors, Inc., for a coal washery including a DMS dense media coal preparation system; capacity 150 tph of 5x¼-in R-O-M.

COAL MEN ON THE JOB . . .

ETHEL CHILTON MINES, Ethel mine, Ethel, Logan County, W. Va.—Stanley Petrosky (left), tipple foreman; J. Mayne McCoy, consulting engineer, McCoy Engineering Co., Charleston; C. W. Jones, general manager; J. D. Deery, chief engineer; L. E. Birley, Silas Campbell Contractors, Madison; and C. B. Levi, project engineer, McNally Pittsburg Mfg. Co.

COAL MEN ON THE JOB . . .

VIRGINIA AND KENTUCKY—Joe Street (left), partner, H. & L. Coal Co., Whitewood, Va.; J. C. Gunn (center) and Otis Withrow, section foreman, Oriole mine, West Kentucky Div., Bell & Zoller Coal Co.

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PENNSYLVANIA
Johnstown—General Electric Supply Co., Div. of General Electric Distributing Corp.
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Pittsburgh—General Electric Supply Co., Div. of General Electric Distributing Corp.
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Knoxville—W. J. Savage Company

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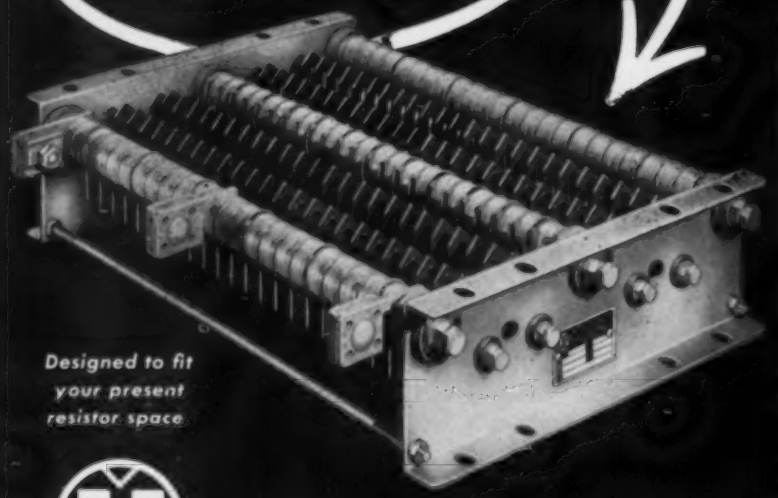

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Pa. District Safety Meets Held

The 9th annual first-aid meet of the Moshannon-North Central Safety Association was held June 25 at New Bethlehem, Pa. The Kramer mine of the Northwest Mining & Exchange Co., captained by Stanley Verona, placed first with a score of 99.067 and was awarded $210 and the MSA plaque. For placing second with a score of 97.933, the Morrisdale Coal Mining Co., captained by Alfred Eyerly, received $175 and the NCA plaque. The Freebrook Corp. cleaning plant, captained by Melvin Thomas, won third place with a score of 97.467; awards were $105 and flashlights from the Pennsylvania Department of Mines. Fourth place, with a score of 95, went to the Westover mine of Cambria Clearfield Mining Co., captained by Wasco Kopilchack; awards were $35 and flashlights from the Pennsylvania Department of Mines. First and second place winners will represent the Moshannon-North Central district in the state-wide meet at Carmichaels, Sept. 10.

The 30th Bituminous District of the North Central District Safety Association held its 13th annual first-aid meet at Indiana, Pa., July 16. The Pennsylvania Electric Co. No. 5 mine, captained by John J. Kruck, won first place with a score of 99.8 and was awarded the MSA plaque, $350 cash and the UMWA trophy. For placing second with a score of 99.467 the Rochester & Pittsburgh Coal Co. Kent No. 2A mine, captained by W. W Thompson, received $210. The R&P Ernest mine, captained by Richard Patterson, took third place with a score of 99.4 and was awarded $175. Fourth place, receiving an award of $140, went to the Imperial Coal Co. Diamond mine, captained by Victor Rengh. First, second and third place winners will enter the state meet.

New Books for Coal Men

Directory of Safety Aids

Occupational Safety Services Guide 2.1 March, 1955, provides company safety directors with a complete catalog of the many and varied accident prevention aids available from the National Safety Council. Listed are training aids for instructing supervisors and workers, periodicals, newsletters, a complete library of technical and administrative publications covering all phases of occupational accident prevention, training films and several hundred made-to-order five-minute safety talks. *68 pp. 8x11-in; paper. Free. National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.*

Ground Stresses at Portals

Stresses Around Mine Openings in Some Simple Geologic Structures, by R. D. Caudle and G. B. Clark, analyzes stresses existing in rock before and after the introduction of mine openings. Effort is made to clarify certain previously neglected points of fundamental research on the subject and to indicate further possible applications of this research. *42 pp. 8½x11-in. paper. $0.65, Engineering Experiment Station Bulletin No. 430, University of Illinois.*

2¼-yd. MICHIGAN 175A carrying over 2 tons of coal in its bucket . . .

This big POWERHOUSE handles bigger jobs cheaper!

Check the specs of the MICHIGAN* 175A:

BUCKET CAPACITY..... 2¼ yds.
WEIGHT..... 24,100 lbs.
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SPEED..Up to 27 mph, Forward and Reverse
HORSEPOWER..... 133 Diesel, 126 Gas, 165 Supercharged

Don't look for "comparative" data on the MICHIGAN 175A—there is *no machine comparable*. This big bruiser is nearly 50% bigger than the next closest machine on the market. From flywheel to bucket, the 175A is built to do bigger, heavier jobs—jobs that no other rubber-tired machine can handle.

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Hydraulic power does the work In spite of its size and power, the MICHIGAN 175A is easier to operate than most machines one-third its size. Hydraulic power does all the real work: power steering, 4-wheel power brakes, power-shifting with two simple levers on the steering column, no clutch pedal.

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Yes, a saving of $137 per day is a big one . . . but entirely possible! If you deep mine 200,000 tons of coal annually, you can save your company $50,000 per year by using OSMOSE TREATED TIES AND TIMBERS. Comparable savings are possible for smaller or larger tonnages. Osmose Ties and Timbers are scientifically treated to resist all types of rot, decay, termites or whatever you prefer to call the wood-consuming action that can annually rob you of a small fortune. Mine timbers are expensive enough but compared to the cost of REPLACEMENT LABOR, today, their cost is trifling.

Osmose Treated Ties and Timbers LAST UP TO FIVE TIMES LONGER saving you both material and labor costs many, many times. No other timbers! No other treating process can surpass Osmose in mine effectiveness or approach Osmose in economy.

That's why the nation's leading coal mining companies substantiate our own natural enthusiasm. For instance The Pocahontas Fuel Company, Inc. says: "Our Company has been using Osmose Timber Treatment, at the various mines, since 1942. We feel that sufficient time has now elapsed to prove the worth of your Treatment, and are pleased to advise that it has been very satisfactory to us."

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Price Fixing

Minimum Price Fixing in the Bituminous Coal Industry, by Waldo E. Fisher and Charles M. James. Comprehensively describes the coal industry's 6 yr of experience with minimum price fixing after passage of the Bituminous Coal Act of 1937. Appraised are the background of the act, the action taken under it, the development of proposed and coordinated minimum prices and other administrative problems. *523 pp. 6x9-in; cloth. $10, Princeton University Press, Princeton, N.J.*

New Periodicals to Aid Supervisory Development

Three new periodicals designed to help industry develop a better supervisory force were started recently by the American Management Association. The publications, comprising the "supervisory development service," will include a monthly bulletin, a monthly annual of tested techniques in action, and semi-annual research reports by specialists. Initial issues are scheduled for publication in May. The AMA's Supervisory Development Service is not directed to foremen themselves but to line and staff executives with responsibility for any phase of first-line supervisory development. Anyone involved or interested in first-line supervisory development, except libraries, consultants and associations, may subscribe to the new service. Additional information may be obtained by writing the director, Supervisory Development Services, American Management Association, 300 W. 43d St., New York 36, N. Y.

Nova Scotia Mining Institute . . . From p 135

This was the keynote sounded for the maintenance and hoisting session by J. A. Russell, chief mechanical engineer, Dominion Coal Co., Ltd., in introducing Wm. Stewart, assistant mechanical superintendent, discussing mechanical maintenance, and John J. Laffin, electrical engineer, discussing electrical maintenance.

Emphasizing that the need is for skill in preventing trouble rather than fixing it afterward, Mr. Stewart summarized inspection and service procedures, lubrication procedure, the training of maintenance personnel, and the development of maintenance facilities. "Conditions and facilities for proper care and maintenance have been improving with the increased use of mechanical equipment," he concluded, "but there is still room for improvement: Mechanics should be carefully chosen, have the necessary technical skill, and a maintenance rather than a repair complex.

"Operators should receive special training before being placed on a new and complicated machine so that they can

NEWSWORTHY ACTIVITIES of your company are interesting to other Coal Age readers, so tell us about them. Write The Editor, Coal Age, 330 W. 42nd St., New York 36, N. Y.

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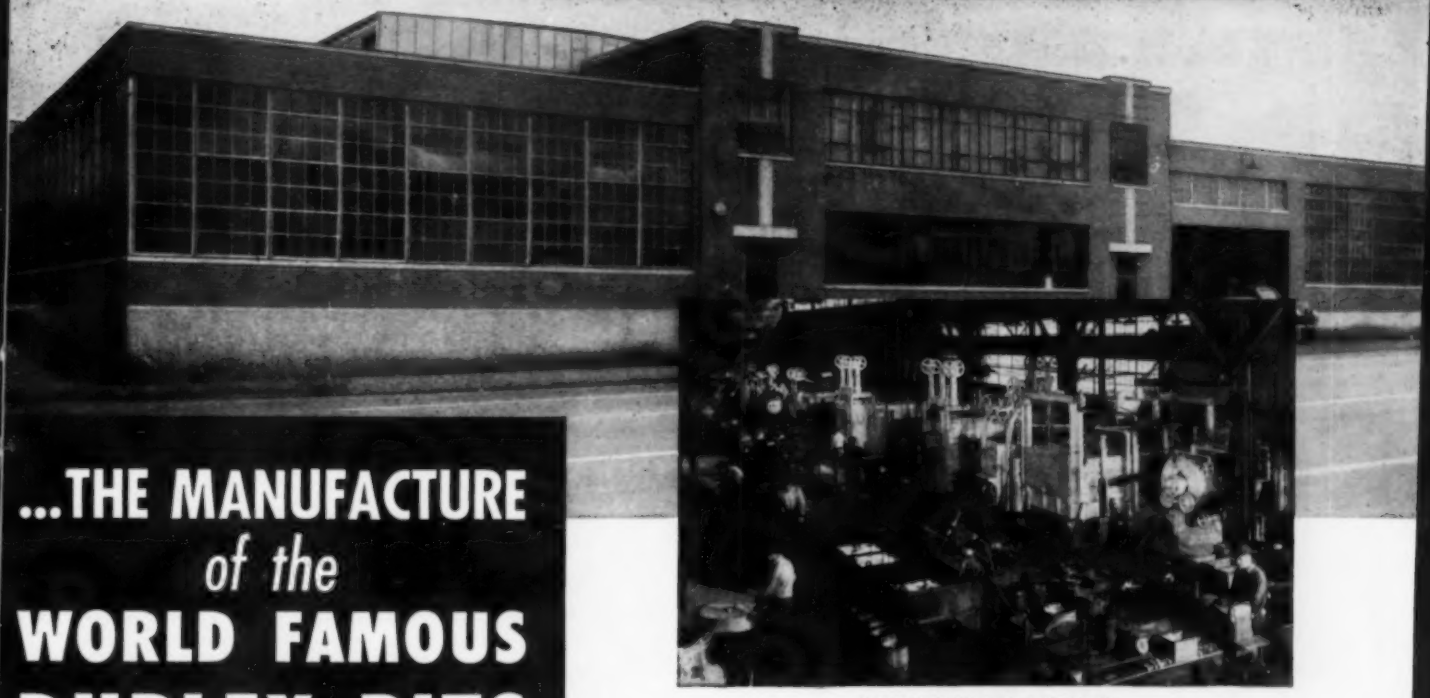

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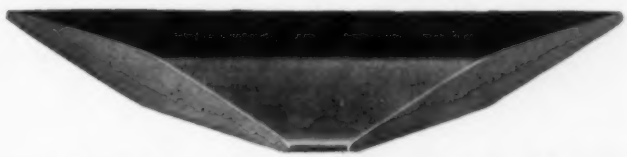
The design and manufacture of Cincinnati Bits is and has been a SPECIALIZED BUSINESS with CINCINNATI MINE for more than a quarter of a century. Today in this modern plant with its own heat treating department is manufactured the world's most complete line of bits. CINCINNATI MINE with its highly skilled personnel in design, research and heat treating has worked closely with mine operators all over the world to produce a broader line of bits for every cutting condition. Remember, whatever your cutting problem, CINCINNATI MINE has the experience and know-how plus the facilities to give you the type of bit that will provide you with maximum cutting efficiency at the lowest possible cost.

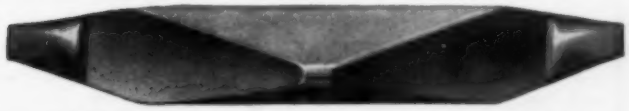
BITS FOR EVERY CUTTING JOB

Illustrated here are just three of the more popular bits in the DUPLEX FAMILY. Not only do we offer a complete line of all types of bits but each type is made in numerous grades to give you the best bit for your particular cutting conditions.



DUPLEX C-11 . . . for all-purpose cutting, this bit offers the best obtainable value in cutterchain bits. Available in various grades . . . is reversible and double-ended . . . has sharp points . . . keen cutting edges . . . long life . . . locks securely . . . easily removed.

DUPLEX F TYPE . . . PLAIN . . . this bit gives you dependable service under the toughest cutting conditions (where other bits have failed) due to its specially reinforced tip which provides a stronger cutting point.



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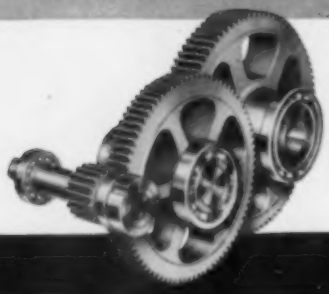

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COAL MEN ON THE JOB . . .

VIRGINIA MEN photographed near Dismal Bridge in the Whitewood section of Buchanan County, Virginia—Frank N. Kersey (left), partner, Kersey Mfg. Co., Bluefield, Va.; Raymond E. Cooper, owner, Jewell Branch Coal Co.; J. Ralph Cox, partner, Cox & Smith Coal Co.; N. E. Clifton, owner, N. E. Clifton Coal Co.; C. C. Youell, superintendent, No. 3 mine, Jewell Ridge Coal Corp.; and C. M. Reynolds, preparation inspector, Jewell Ridge Coal Sales Co.

detect signs and symptoms indicating the likelihood of parts failure, and be able to correct, or have corrected, any such faults before a breakdown occurs. Finally, officials who insist that mechanics and operators attend closely to the maintenance of equipment in their charge will have relatively uninterrupted output."

Both safety and efficient operation demand that electrical maintenance be planned and carried out efficiently, said Mr. Laffin. Safety, among other things, requires certified flameproof apparatus maintained in flameproof condition and, to reduce the shock hazard, remote control of machines through intrinsically safe low-voltage control circuits, plus ground-fault protective equipment. Joining Mr. Stewart in emphasizing prevention rather than repair, he offered detailed suggestions for preventing trouble with main high-voltage cables, trailing cables, stationary mine motors, motor starters, and auxiliary equipment. These he summarized in a convenient check chart, observing that "an efficient maintenance program demands a rigid schedule of inspection and replacement."

Mine hoist development in Canada was outlined by J. M. Whatley, Canadian Ingersoll-Rand Co., Ltd., with emphasis on a comparison of drum and friction-type units. The latter, he concluded, have their place in certain types of hoisting from depth over approximately 1,500 ft, but are not a universal answer to hoisting problems. The right type of hoist in each instance can be derived only from a study of all factors.

SHIPPING AND EXPLOSIVES

Improvements in coal-shipping facilities at the International Pier, Sydney, N. S., by Mr. Russell, and developments in explosives, by Kenneth M. Ed, Canadian Industries, Ltd., were topics at the concluding session, with Mr. Hartigan presiding. Pier improvements got under way in 1954, and included replacement of steam-car-spotting locomotives with rubber-tired pushers, installation of monorail supported car shakeouts, and installation of sidewall loaders for quicker loading and trimming of the larger colliers. Labor requirements were materially reduced, loading rate is now well over 340 tph, compared to 185 tph in 1953, and

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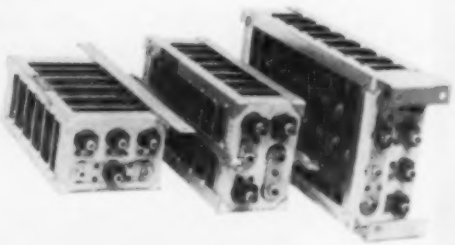

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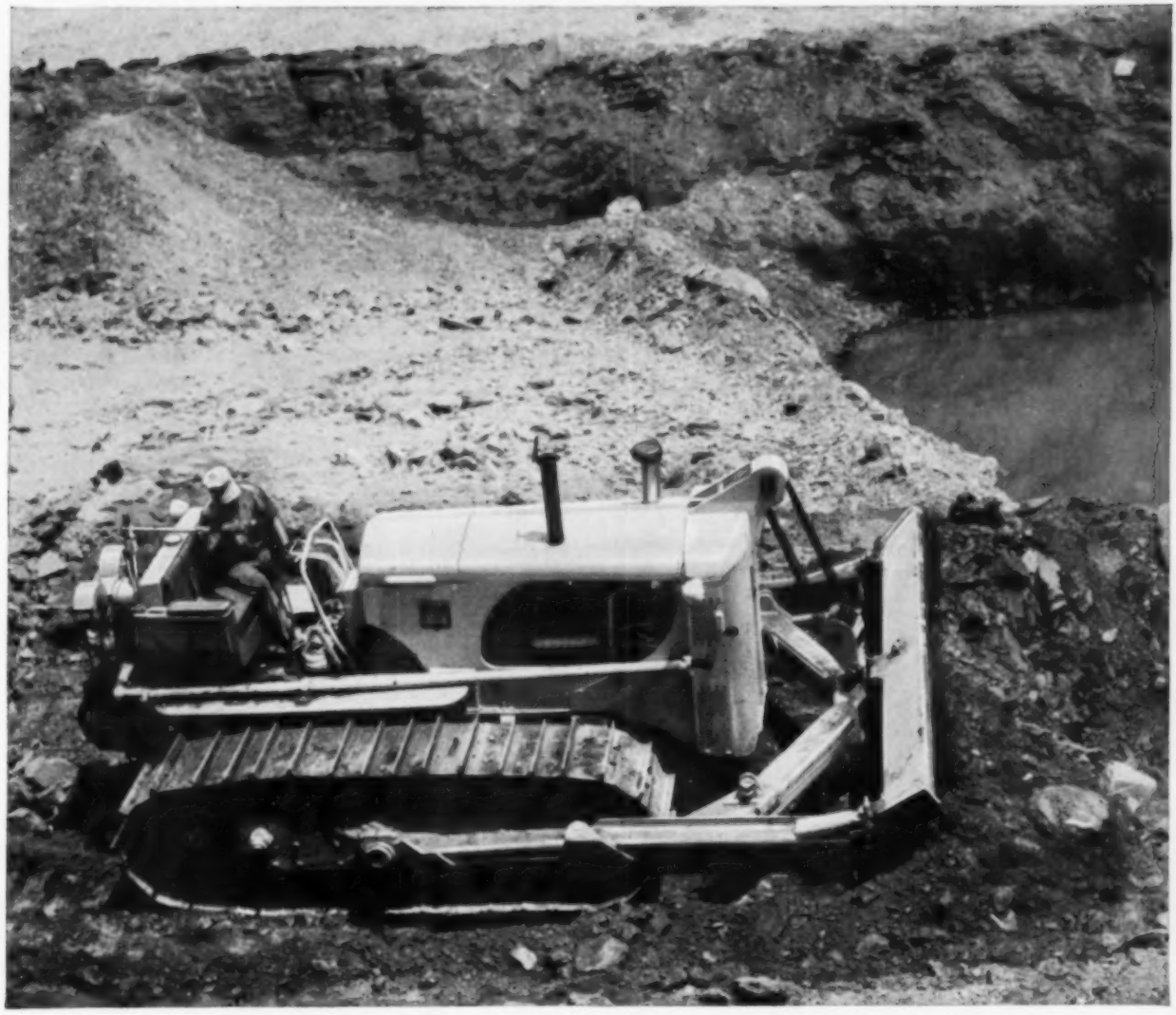

Fast dozing and reverse speeds put OC-18 money ahead on strip operations

The high performance diesel engine in the Oliver OC-18 crawler has an exceptional torque span that steps up lugging as the tractor slows under load. In first gear, the OC-18 delivers 31,000 drawbar pounds' pull at 1½ miles per hour!

With power like this to back you, those long, heavy dozing runs go fast. And with a high reverse gear of 3½ miles per hour, the OC-18 clips even more time from your dozing cycle. You'll be able to move more yards in less time—pile up bigger profits on every job.

This husky crawler packs a big 133 drawbar horsepower. But powerful as it is, it operates with the ease of an automobile. Finger-tip air steering, clustered controls, center-positioned gear shift and comfortable seat are features that cut operator fatigue, increase performance and productivity.

For the real test, try this tractor yourself. See why you can do a bigger, better job at less cost with the Oliver OC-18. Call or visit your Oliver Industrial Distributor for a demonstration.

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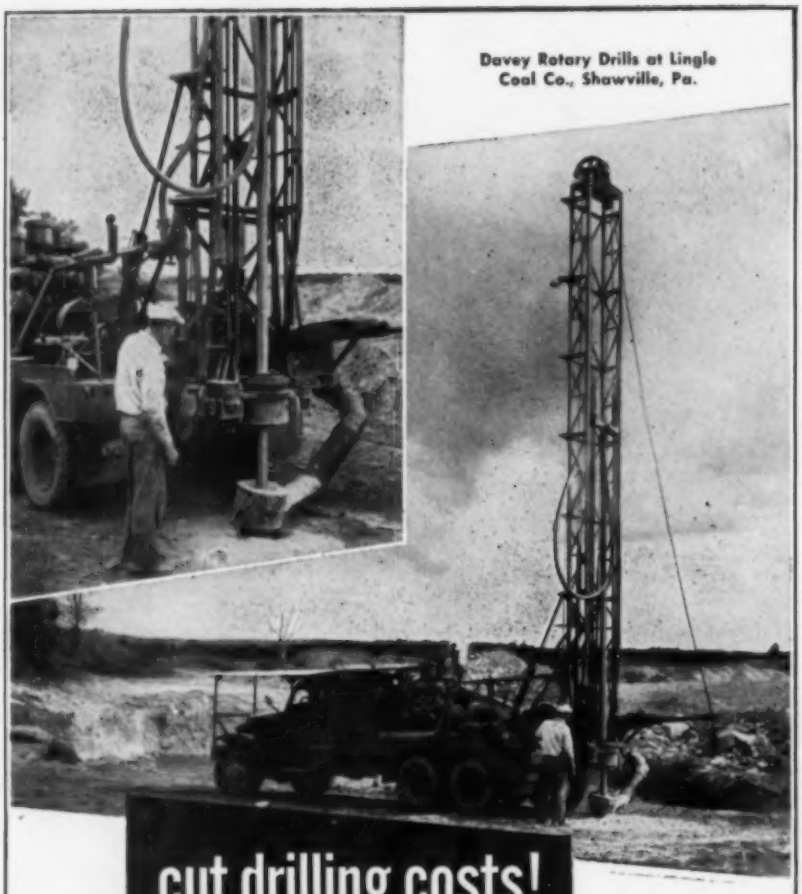

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Daveys are available in 6 different models—air blast, mud pump, or combination types. Rated capacities to 2,000 ft. Outstanding features include choice of power take-off or separate power unit operation, automatic hydraulic feed, hydraulic pull down, heavy-duty rotary table, rugged tubular box-type mast . . .

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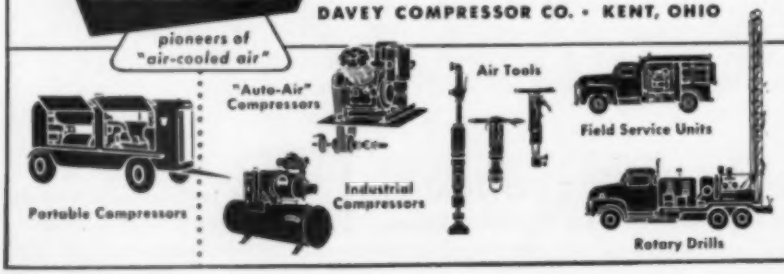

collier turnaround has been materially speeded up.

Summarizing briefly the history of the development of explosives and detonators, Mr. Ed emphasized the advantages of new methods of sensitizing ammonium nitrate for greater safety and lower cost in open-cut mines and construction, of electrical initiation of igniter cord, and of millisecond delays, concluding with a detailed description of how explosives were used for various purposes in the new power project of the Ontario Hydro-Electric Commission.

Rocky Mountain Mining Institute . . . From p 128

lieved it became deficient in oxygen to the extent that it would not support combustion, Mr. Olsen read.

The argument that the more air that is put into a caved area, the cooler it will keep the area, is true provided the cooling air gets directly to the heating area. Since air travels along the path of least resistance, certain areas of the cave will have very little air passing over them.

The Federal Code required more air to be passed over the caved areas to clear all methane. When this was done by increasing the air from 25,000 to 60,000 cfm in the section, CO was detected in the return within 90 days. The area had to be sealed and management believed that overventilation of the caved area was the cause.

To prevent fires in the future, management has revamped the pillaring system and maintains a bleeder entry. Working areas have been trimmed to a minimum size of 300 x 2,000 ft for economical mining while still maintaining a factor of safety in case of fire. Adequate planning of sections has been done so that a fire can be sealed at predetermined points with a minimum of delay and expense. All personnel have been alerted to the possibility of fires and inspection of pillars and returns has been increased. Safety engineers have been equipped and trained to do air sampling and analysis so management can have immediate information on any changes in the atmosphere, Mr. Olsen concluded.

SAFETY

Safety was the topic at the Tuesday morning session, at which C. A. Carlson, institute president, presided. Following a paper on the Safety Program at the Frederick Mine of the Colorado Fuel & Iron Corporation, by Frank C. Bennett, superintendent, Valdez, Colo., the remainder of the session was devoted to a panel discussion on coal mine safety. Thomas Allen, chief, Coal Mine Inspection Department, Colorado, served as chairman of the panel. Other members of the panel were as follows: Lyman Fearn, state mine inspector, Wyoming; John A. Garcia, inspector of mines, New Mexico; James Westfield, assistant director, Health and Safety Division, USBM; J. Howard Bird, supervisor, District H, USBM; Anthony C. Moschetti, coal mine inspection supervisor, USBM; Kirk V. Cammack, mining engineer,

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Use "lasts-forever" CARLON* Plastic Pipe for water drainage, and other services

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Carlon plastic pipe has been used successfully for many years in drainage lines to carry off corrosive mine waters and for water distribution lines. Every foot installed for this purpose is still as good as ever!

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We are interested in Carlon plastic pipe for coal mines. Please send more information.

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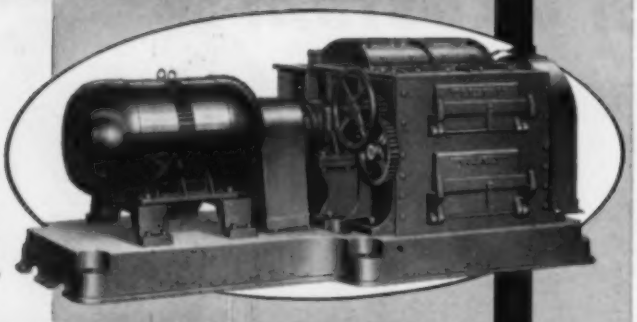

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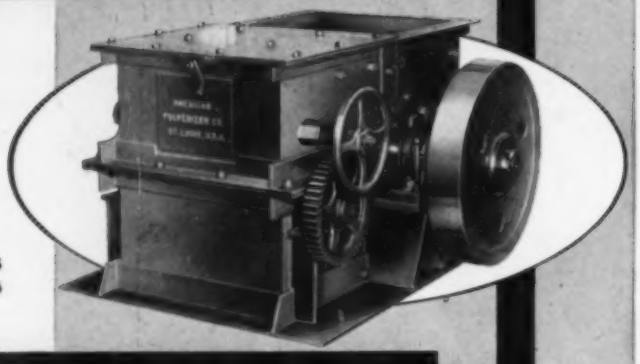

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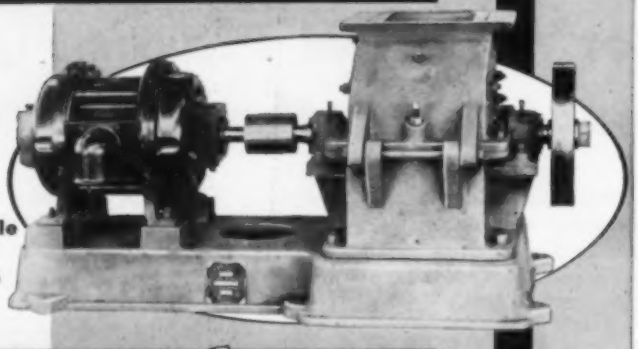
the Best Answers*. . .



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USGS; Emery Olsen, supervisor of safety, Coal Mines & Quarries, Columbia-Geneva Steel Div.; and Francis Leonard, safety engineer, Colorado Fuel & Iron Corp.

Frederick mine is said to have more roof area over active workings, haulageways and airways than any other mine in the United States. Since there are 264 working faces, one can readily see the program of preventing accidents resulting from roof falls at the face, Mr. Bennett declared. All entries are roof bolted and timber has been replaced by bolts in many areas in old entries. With few exceptions, the roof permits good bolt anchorage and to date, there are 19 mi of bolted entries.

The safety program at Frederick mine is nothing new, continued Mr. Bennett, only a rigid enforcement of company rules. A steady improvement has been made in the safety record over the past few years and the company goal is a perfect record. In 1954, Frederick worked 736,712 man hours with 122,785 man hours per lost-time accident. Frequency was 8.14 and severity was 0.749. Up to June 1 of this year the mine operated 4,156,154 man hours without a fatality—more than four times the average for the industry. The mine also worked 356,611 man-hours up to June 1 with only one lost-time accident, Mr. Bennett added.

Included in the safety program are 100% training in first aid, training of mine rescue teams, and supervisor training in accident prevention by the USBM. A Holmes Safety chapter was organized about a year ago and monthly meetings are held in the club house. Door prizes, awarded when the mine has a perfect safety record for the preceding month, have maintained interest and helped keep attendance high. Much of the success of the accident-prevention program is the result of the co-operation received at these meetings, Mr. Bennett declared.

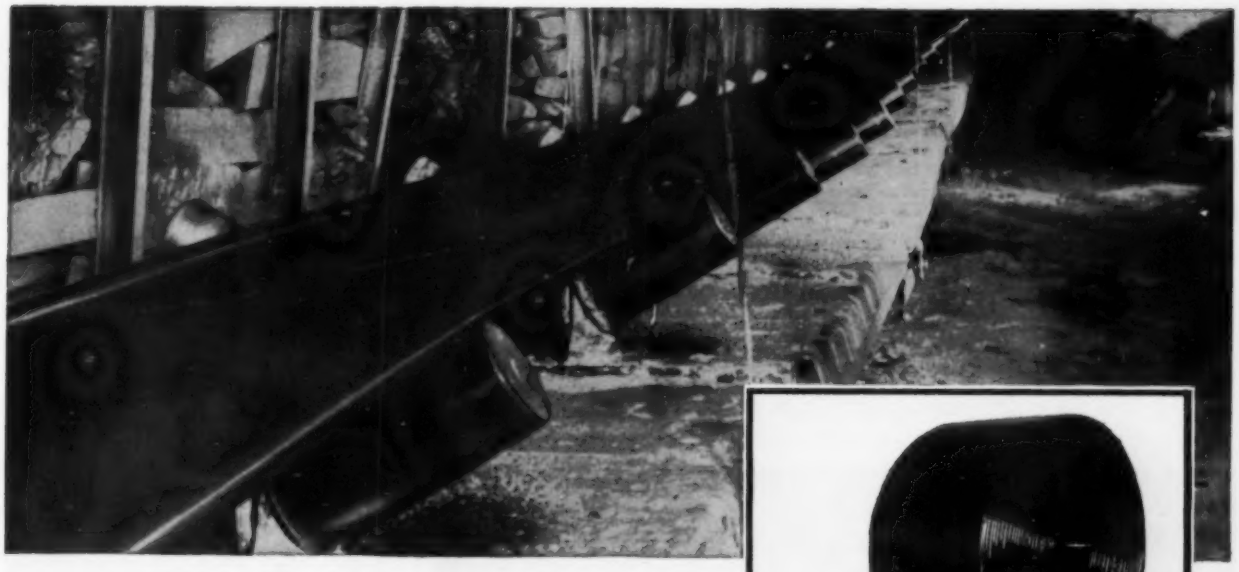
In recognition of continuous service without a lost-time accident, the following Holmes Safety awards were made: 67 silver buttons for 20 yr service and 52 gold buttons for 30 yr, a total of 119 employees who have worked more than 20 yr without an accident. Nine employees have worked more than 40 yr without a lost-time accident.

Common sense and full co-operation from the union safety committee, federal, state and company inspectors are big factors in the success of the program. Complete backing from top officials of the company also plays a major role.

A panel discussion on safety, led by Thomas Allen, included the following 10 questions and discussions:

Q: What more can be done to prevent roof-fall accidents?

Mr. Olsen said that it is better to understand some of the causes before going into the topic. Analysis of roof-fall accidents indicates that fatalities are resulting from the same things as in the past. And these are mostly human failures except in a few instances. To reduce accidents, the reasons why men fail to carry out proper procedures must be looked at and steps taken to overcome them. Men gamble on the roof to complete some task and often are injured.



Inset shows roll of SCANDURA. Photo at left shows Face Conveyor in coal mine.

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Minimum timbering standards, keeping the men safety conscious through bulletins and meetings, inducing workers and supervisors to accept individual responsibility, changing mining plans in high coal, and improving machine design are some of the things that can be done to help reduce accidents.

Mr. Garcia said that New Mexico is concentrating more than ever on roof-control problems and that poor judgment of the man in charge sometimes results in accidents.

Mr. Westfield observed that the problem is not individual mines, but is universal and the industry is going backward as far as fatalities are concerned. Some of the reasons are a letup in maintenance and reduced educational activities because of the economic condition of the industry. During the first five months of 1955, 100 men were killed by roof falls compared to 92 during the same period in 1954. The 216 fatals from falls of roof, face and rib in 1954 were 55% of all the men killed underground. About 75% of the fatalities from roof falls resulted from accidents within 25 ft of the face. Over half the fatalities occurred between the last permanent roof support and the working face. The larger mines are having better frequency rates than the smaller ones and this is believed to be the result of good safety programs in the larger companies and lack of them in the smaller ones.

Mr. Fearn declared that his state has had better experience where cycle bolting or timbering is practiced and therefore cycle roof support should be practiced.

Mr. Allen advocated sawed crossbars, strict enforcement of safety rules, use of vertical legs under crossbars and setting of temporary bars on jacks for temporary face support as measures to reduce accidents.

Q: Why shouldn't back entries and parallel entries connected to haulage entries by open crosscuts be rock dusted as well as haulage entries?

Mr. Westfield declared that this subject is one of the headaches of the Bureau. Investigation of the Jamison explosion indicated that it was necessary to take another look at the mines, particularly in the back entries. The Bureau intends to require a good cleanup at the face and material left between inspections will have to be cleaned up. Companies will be asked to put rock dust on the roof and ribs as well as on the floor.

Mr. Leonard observed that dust barriers were used but general dusting was proved better. If all places aren't dusted, then there is an opening where an explosion can propagate.

Mr. Cammack said that very few mines are adequately dusted throughout their entire area. The quantity of dust used in the life of a mine and the tons of coal mined indicates how well it is dusted.

Q: How can interest, attendance and participation by mine workers and officials be increased at the coal-mine accident-prevention courses conducted by the Bureau of Mines?

Mr. Bird declared that if the classes

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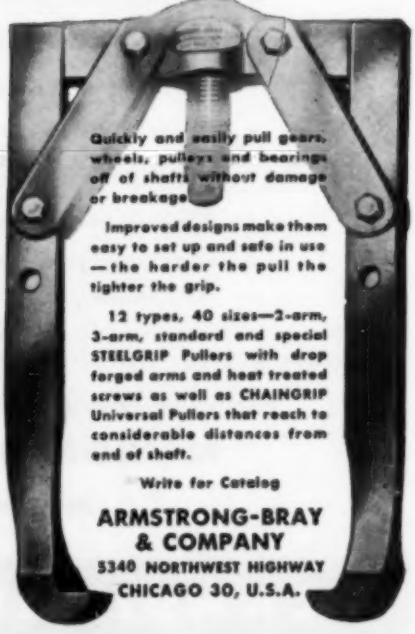
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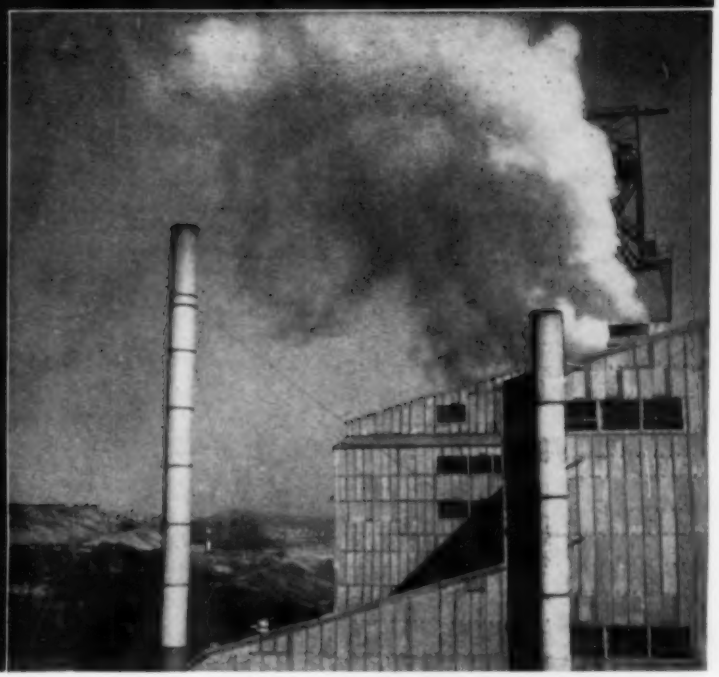

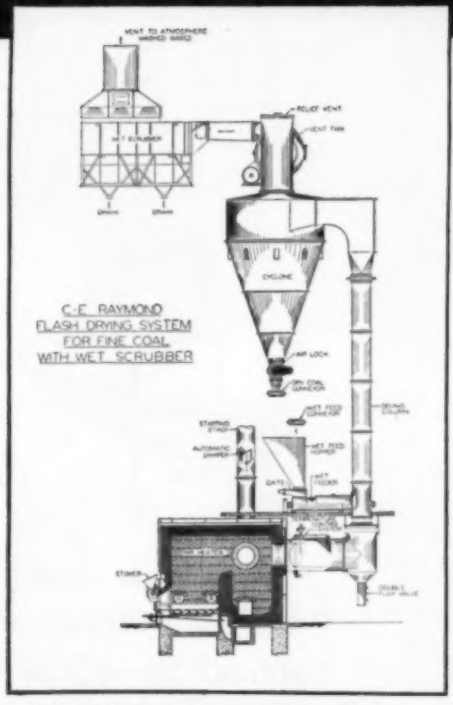

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are interesting enough for management to attend, the workers will also attend. The instructors must present the material in an interesting way if good attendance is expected.

Mr. Olsen noted that 100% training has been completed at two of his company's mines and that the program would not have been successful without the support of the UMWA. It would be helpful if the course were modernized and kept entirely in the field of safety.

Mr. Leonard said that the Bureau courses still are in session at his company and the Bureau is teaching them in an interesting manner. The men who completed the course first have become salesmen for it.

Mr. Garcia declared it would be helpful if more officials attended the classes.

Mr. Westfield commented that the Bureau is looking at the course with the view of modernizing it with various teaching aids and would welcome suggestions from industry.

Mr. Allen said that up-to-date companies have had a great deal to do with the better safety record by taking a scientific approach and using new methods. Small-size publications written in a simple interesting style would be helpful training tools.

Q: As mine development becomes progressively deeper, will it be necessary to adopt new standards concerning the use of booster fans in underground locations?

Mr. Cammack remarked that as mines get deeper a hard look should be taken at past ventilating practices. In time some mines probably will be forced to adopt practices now in use in Europe, including booster fans.

Mr. Westfield commented that there isn't too great a demand for booster fans since most mines have fairly light cover and new shafts can be readily sunk for ventilation purposes.

Mr. Allen added that he believed there definitely will be a place for booster fans where the coal dips and the surface rises, such as it does in many western mining areas.

Q: What are the advantages and disadvantages of bleeder entries?

Mr. Westfield observed that if the bleeder system is used, be sure that it is working. If it is kept in good condition little gas will be found and there will be fewer fire problems.

Mr. Olsen said the advantages are that the pillar line can be kept clear of noxious and explosive gases, but the success of the method depends of local conditions. Disadvantages cited were a reduction in the quantity of recoverable coal; danger of spontaneous combustion and fires; and costly maintenance if they are kept open.

Mr. Allen pointed out that a bleeder system can be used in some mines and not in others. Working a mine in districts and solid sealing may be more effective.

Q: Are pillared areas ventilated sufficiently to eliminate the hazard of methane entering the working places?

Mr. Cammack said that it depends upon

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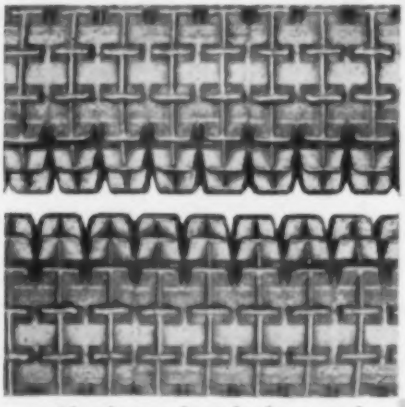

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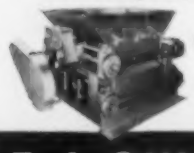

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the mine and the area in which it is located. In some areas it is impossible to eliminate the hazard.

Q: Should the coal mining industry permit diesel-powered equipment to work underground (a) for economical reasons and (b) for safety?

Mr. Westfield said there probably will not be diesels underground under the present thinking of the mine workers. The problem should be approached by a discussion with the workers.

John H. East commented from the floor that he believes in diesels underground and an unfavorable attitude toward them is the result of a lack of knowledge. If a mine is well ventilated there need be no fear of toxic gases. Aside from good ventilation diesels must be maintained properly.

Mr. Olsen remarked that ventilation is the answer to use of the diesel and perhaps is more important than permissibility. The diesel eliminates the trailing cable which is the greatest hazard in a coal mine and therefore improves safety.

Mr. Bird observed that all the problems cannot be dismissed with good ventilation. Maintenance is as important as the proper ventilation.

Q: Small mines in Colorado, three men or less underground, may be operated without the use of a fan; yet standard regulations require 6,000 cfm through the last crosscut. Obviously, natural ventilation will not give a steady current of 6,000 cfm. What is the answer?

Mr. Cammack said that the standard is unrealistic when applied to the small mine.

Mr. Allen declared that he believed in the installation of a fan, especially in case of a fire.

Q: Continuous miners are gradually being introduced in our underground mines. How can we get the best ventilation in the high-speed face advance in places where such machines are being used? Do you think the line brattice is as effective as the auxiliary fan in such workings?

Mr. Westfield commented that there is a provision in the code that permits use of auxiliary fans. Such a fan can improve the ventilation and they can be used safely.

Mr. Moschetti said investigations have been made and that the Joint Industries Board has set down rules that should be lived up to where permission is given to use auxiliary units.

Q: Present standards for rock dusting working places require rock dust to be applied with 40 ft of the face. Can rock dust be kept up satisfactorily in continuous mining places? If so, how should it be done? If not, what are your suggestions of distances from the face other than 40 ft, and how do you think the maximum safety can be established by any methods?

Mr. Cammack said the only way it can be done is to use water sprays until the machine moves to another place and then dust.

Mr. Westfield remarked that the industry has been solving this problem. Some companies shut down the miner and then rock dust. Wet rock dusting also can be used effectively.

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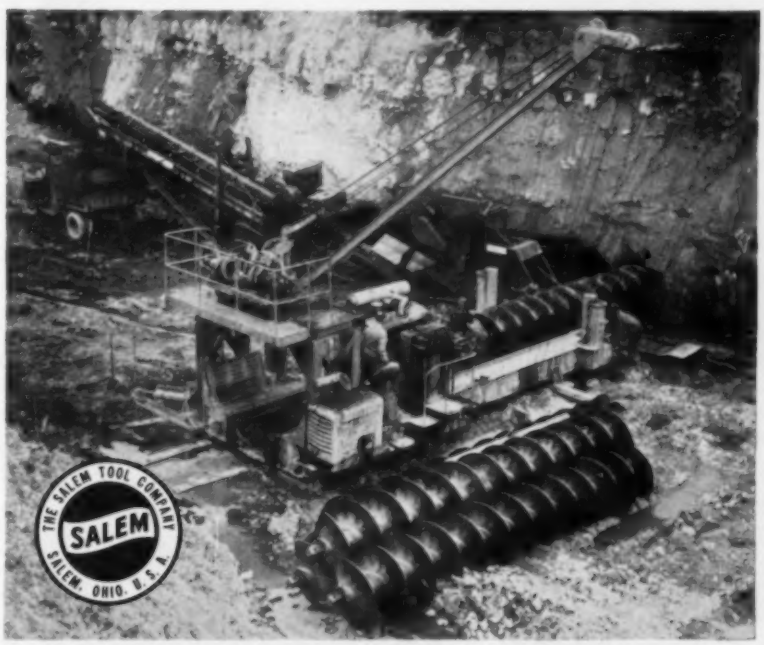

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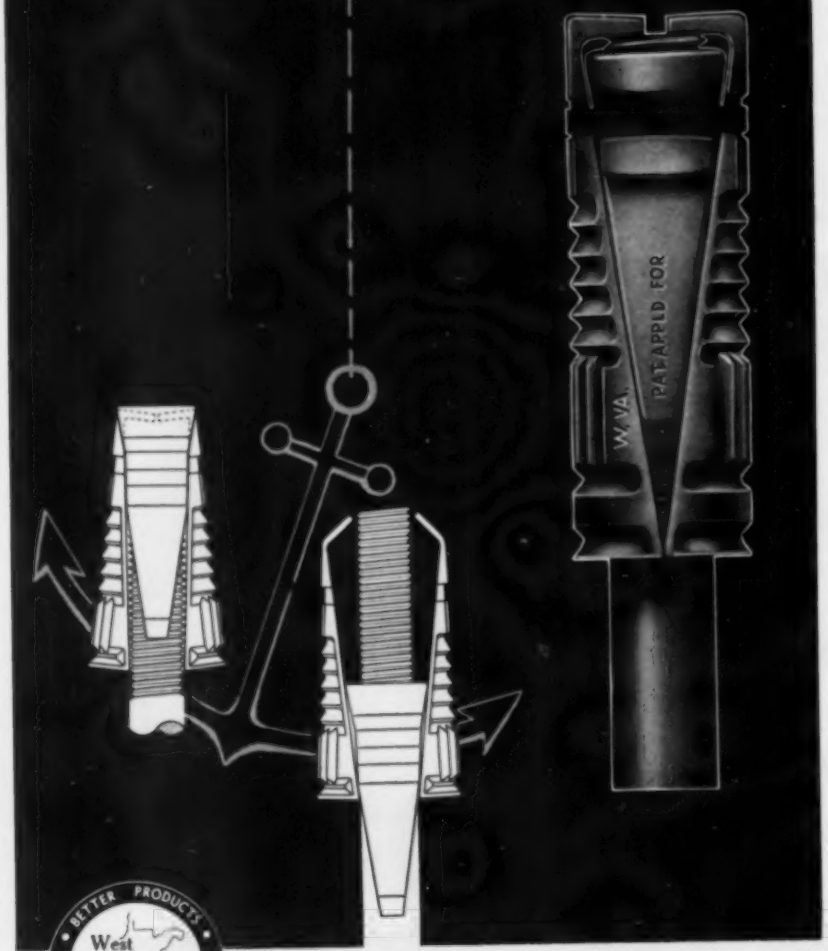

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LEGISLATION AND MARKETING

Legislation and marketing were themes of the Tuesday afternoon session, presided over by B. P. Manley, Utah Coal Operators Association, Salt Lake City, Utah. Chairman of the session was Oscar A. Glaeser, vice president, United States Fuel Co., Salt Lake City, Utah. The New United States Fuel Policy—Fact or Fiction, by Dr. Charles J. Potter, president, Rochester & Pittsburgh Coal Co., Altoona, Pa.; Unnatural Gas Competition by Robert E. Lee Hall, general counsel, National Coal Association, Washington; and Western Coal Markets by A. B. Foulger, vice president, Lion Coal Corp., Ogden, Utah, were major topics.

In discussing the U. S. Fuel Policy, Dr. Potter asked whether there is a policy that meets the needs of the country so far as the following are concerned: (1) ample supplies at reasonable prices to meet the needs of a growing economy; (2) surplus capacity to meet a national emergency such as coal did in the past but may not be able to do now; (3) subsidy only in case of a national emergency; and (4) an intelligent policy of conservation.

The gas industry is the only industry where price is fixed at the point of origin, observed Dr. Potter. Gas transmission lines, however, are not regulated but distribution is. The Cabinet Committee recommended that producers should not be regulated but that pipelines should be. The government's position so far is not being noted by Congress, Dr. Potter added.

On the subject of crude oil imports, Dr. Potter said that oil from the Near East is underselling domestic products by $1-$1.50 per bbl. Rates of discovery in the United States are at a low mark in comparison to what we use because of the high import of foreign oil. Although it was suggested that imports be held to 10% of requirements, they are running ahead of that now. Residual oil imports also are ahead of suggested figures.

The government has not done any appreciable amount of research in oil, gas or coal. Oil and gas do not need help along these lines and coal does not require it if taxes and the like were the same as for oil and gas. There are about 200,000 men working in the coal industry and they could hardly be expected to produce enough to meet a prolonged national emergency. Therefore, the government should take steps to see that these men are not lost and that the coal mines are not closed, Dr. Potter emphasized.

Among other items cited by Dr. Potter were discriminatory freight rates, trade barriers on export coal and no government fuel-purchasing policy and he concluded that, so far, a government fuels policy is fiction.

Unfair gas competition as faced by the coal industry is unfair in the worst way, said Robert E. Lee Hall. The gas industry through legislation has 27½% depletion as against 10% for the coal industry. And the gas industry has the right of eminent domain for construction of pipelines.

The coal industry has been trying to

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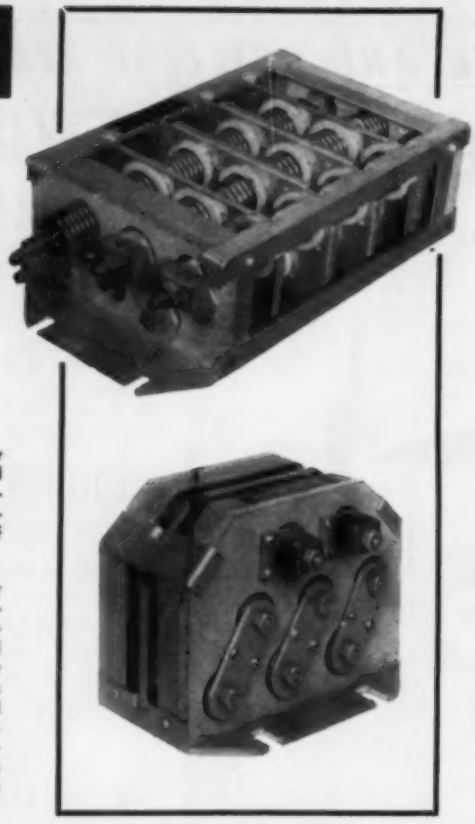

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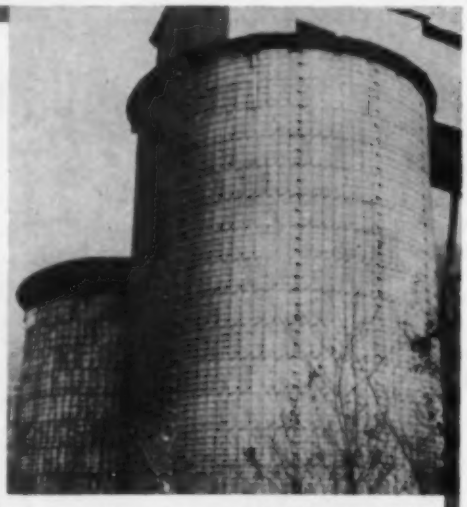

These two Neff & Fry Silos receive coal direct from the mine mouth en route to the tipple. The larger one was erected first. The other was erected some years later for additional capacity.

About a day's output of coal can be accumulated in the silos if production exceeds withdrawal. In other words, the silos serve as reservoirs or surge bins to store temporary surpluses of coal. Numerous Neff & Fry Silos are used at mines for this important purpose.

In solving handling and storage problems for hundreds of producers and processors of bulk materials, we have gained a great deal of experience which can be of much value to coal companies. You are invited to communicate with us for specific information.

Not exported except to Canada and Mexico

THE NEFF & FRY CO. • 228 Elm St. • Camden, Ohio

SUPER-CONCRETE STAVE STORAGE BINS ⬆ NEFF & FRY

fight the interstate phase of gas distribution that permits unregulated direct sales along transmission lines. Income from these sales are not counted in rate bids and the Staggers Bill would plug this leak by taking over control of direct sales rather than leaving it in the hands of the states, Mr. Hall commented.

Both the Congressional committee and the Federal Power Commission are prejudiced against coal and therefore the industry should get more active in these organizations, Mr. Hall said.

Western coal markets have been narrowed by the invasion of other fuels that have been able to command the respect and desire of the people, said Mr. Foulger. Coal markets are found largely from the ability to produce at a low cost but another factor is freight rates. Today the railroad freight charge is about the same as the production cost.

Coal operators cannot continue to observe wage increases as they have in recent years. The year 1954 probably was rock bottom in production and 1955 marks the upswing. In the last 20 yr, energy demand has more than doubled and in the next 19 yr will double again and oil and gas cannot fill the gap, Mr. Foulger declared.

To help cut the price of coal and overcome the convenience appeal of gas, the industry must have the help of the railroads. Convenience demands a lot of respect and the price of coal must be reduced. It would be helpful if mining personnel were acquainted with the market needs and then set out to get the lowest cost possible. Coal salesmen also should be interested in the mining and processing of coal, Mr. Foulger emphasized.

A discussion of the Barrett Bill by Fred W. Bennion, executive director, Wyoming Taxpayers Association, was the topic at the wind-up session on Wednesday morning. V. O. Murray, Union Pacific Coal Co., Rock Springs, Wyo., presided.

The Mineral Leasing Act of 1920 takes all mineral royalty income from public-land minerals and then specifies return of 37½% to the state of source; 52½% to the reclamation fund and the remaining 10% to the U. S. Treasury. The Barrett Bill would return all royalties to the states, Mr. Bennion declared.

The people must be informed and the public-land states must unite if the Barrett Bill is to be passed. Time may be running out on mineral income since they are wholly depletable. Citing Wyoming as an example, Mr. Bennion said they cannot afford to export both minerals and income from mineral development.

Precedent and climate are favorable to the Barrett-Thompson legislation. The 83rd Congress recognized the rights of the coastal states to the minerals underlying the tidelands. This makes obvious the correctness of the position of the public-land states in asking for control of the minerals beneath the lands within their borders. Furthermore, older states of the Union were accorded full ownership of the lands and all the minerals thereunder within their borders, Mr. Bennion declared.

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For complete, detailed information about our service, fill in the coupon or write for your copy of our free Business and Industrial Direct Mail catalogue.

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SEARCHLIGHT SECTION

(Continued on pages 170-173)

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

Mining Engineer, graduate, 30-50, experienced in highly mechanized coal mining with good practical and theoretical knowledge of mine ventilation. Duties to include supervision of underground survey crews and map draftsmen, plans for development and exploration and mine projection. Applicant must be in good health. Salary commensurate with experience and qualifications such as professional registration. Location Virginia. P-6943, Coal Age.

OPPORTUNITY FOR COAL CO.
INTERESTED IN EXPANSION IN ITS OWN AND OTHER FIELDS FOR THE PURPOSE OF GREATER PROFITS FOR THE COMPANY. EXPERIENCED REPRESENTATIVE AND PROMOTER WITH EXCELLENT BUSINESS BACKGROUND OFFERS EXCLUSIVE SERVICES FOR ABOVE OPERATION.
RA 7066 COAL AGE
330 W. 42 ST. NEW YORK 36, N. Y.

SELLING OPPORTUNITY OFFERED

Explosives Sales Opportunity—we need a man with explosives experience for an attractive sales opening. The person selected will sell and promote the sale of commercial grade ammonium nitrate for the preparation of Akremite. This permanent position in a new field is with a rapidly expanding company and offers considerable opportunity to advance. In reply state experience, education, age, salary requirements, and any other pertinent information. Replies should be directed to: S. N. Gay, Sales Manager Commercial Products, Spencer Chemical Company, Dwight Building, Kansas City 5, Missouri.

POSITION WANTED

Mining Engineer—Retired, 40 years experience; well acquainted with Illinois and mid-western coal fields; available for consultations, inspections and reports. PW-7131, Coal Age.

WANTED

ANYTHING within reason that is wanted in the field served by Coal Age can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

COAL MINING PLANT FOR LEASE

Coal acreage located in celebrated Connellsville region of Western Pennsylvania, a superior quality metallurgical fuel. Minimum investment required to place mine in condition for immediate operation. Mine equipped with coal washery, coke ovens, etc. Approximate capacity 600 tons daily.

Address: BO 7182—Coal Age
330 West 42nd Street
New York 36, N. Y.

SHAFT HOISTS

We are in the market for single and two-drum mine shaft hoists. We have large market for all sizes.
W-6353 COAL AGE
520 N. Michigan Ave., Chicago 11, Ill.

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$1.20 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.
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DISCOUNT OF 10% if full payment is made in advance of four consecutive insertions of undisplayed ads (not including proposals).
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For Sale:

Choice of two Northwest Draglines, one Model 95 with 2½ yd Bucket, other 78 with 2½ yd Bucket.

Also Shovel front with 1¾ yd Bucket.

Also one 1201 Lima Hi-Lift Shovel with 2½ yd Bucket. All in daily operation and good operating condition. Will sell any two of the three. Buying larger equipment. Further details write or phone:

Adams Mills Coal Company,
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FOR SALE

42" Gauge Mine Cars
44—All-Steel rotary dump, ACF 12' x 6' x 3', 5 ton, roller bearing.
150—Composite, end dump, 12½' x 6' x 3', 4 ton.
Blueprint available.
Located for easy loading on C&O at Van, W. Va.
Call or Write:
Western Pocahontas Corporation
P. O. Box 509, Huntington, W. Va.
Phone 28268.

BARGAINS

IN REBUILT AND SLIGHTLY USED EQUIPMENT

8—Joy 14BU-3PE Loaders.
4—Joy 11BU Loaders.
5—Joy 8BU-11E Loaders.
7—Late type 660 Goodman Loaders, 250 V, low type, cat mounted.
1—42" Joy Belt Conveyor, 1100' centers, complete with motors, drives, speed reducers and all appurtenances.
2—30" Joy MTB Belt Conveyors, 1500' each.
5—5-SC Joy Shuttle Cars.
5—Joy 32E-9 Shuttle Cars.
6—Joy 42E-9 Shuttle Cars.
2—Jeffrey 29-UC Cutting Machines.
3—Jeffrey 29-UR Cutting Machines.
1—Joy 10-RU Cutting Machine.
1—Practically new Marietta Continuous Cutting and Loading Machine, 250 V. Less than a year old.

LOCOMOTIVES

5—15-ton Jeffrey MH-110
4—18-ton Jeffrey MH-77
2—20-ton Jeffrey MH-77
2—13-ton G.E. HM-829
2—20-ton Jeffrey MH-77 Locomotives complete with air brakes and sanders and contactor controller. Practically new.

Above Locomotives are now 42" and 44" gauge, but will change to meet your requirements. All are completely rebuilt.

MINE CARS

150—American Car & Foundry Company 1-2-3 Drop Bottom Mine Cars, capacity 227 cu. ft. level full, 40" high, 42" gauge. Practically new.
300—Sanford-Day 6-ton Rotary Dump Mine Cars, all steel, 42" gauge.
140—Practically new 6-ton all steel Sanford-Day Drop Bottom Mine Cars, 48" gauge.
6—300 KW G.E. and Westinghouse Rotary Converters, Type HCC-6, Form P, 1200 RPM, 275 V DC, 2300/4000 V AC transformers, switchboards and switchgear.
7—200 KW, 300 KW and 500 KW G.E. Motor Generator Sets, 250/275 V DC, 1200 RPM, 2300/4000 V AC, complete with full automatic AC and DC switchgear.

HOISTS

Several single and double drum slope and shaft Hoists complete with 400 HP to 1000 HP motors. Complete specifications on request.

MANY OTHER ITEMS TOO NUMEROUS TO MENTION HERE. MAIL US YOUR INQUIRIES.

COAL MINE EQUIPMENT SALES COMPANY
FRANK J. WOLFE PHONE L.D. 34 SHELDON J. WOLFE
TERRE HAUTE, INDIANA

A.G.
DIESEL ENGINES • GENERATOR SETS
10 TO 2000 KW • AC&DC • GUARANTEED
SCHOONMAKER CO., INC.
50 CHURCH ST. NEW YORK 7, N.Y.
Plants: SAUSALITO (S.F.) CAL., JERSEY CITY, N.J.

1—850 HP Hoist—Drum 12' x 13'—holds 12000' of 1⅝" rope—Dynamic brakes—Full elec. controls—speed 1500' P. M. Excellent operating condition.
1—750 ton Salt Block Press—for making 50# salt blocks for Cattle. In top operating condition.
2—Jeffrey 74 B R—Hyd.—Coal drills, on rubber tires.
1—Marion 7200—5 yd.—140' bm. dragline—Ex. shape.
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FOR SALE
LINK BELT CRUSHER
DIAMOND PT. ROLLS, 22" x 17".
2 RILEY "ATRITA" COAL PULVERIZERS.
225 POLES, 16' to 18', 8" TO 10" TOPS
LEWIS TAR PRODUCTS CO.
BOX A, LYONS, ILL.

PULVERIZERS

2 Strong-Scott Coal Pulverizers
(1) Model B-15
(1) Model B-12
FS-7205 Coal Age
330 W. 42nd St., New York 36, N. Y.

ROTARY CONVERTERS

500 KW (2) G.E. HCC6-275 v. DC 1200 RPM #4006716-7 with 3-200 KVA Transformers Type H-J-KDD 13800 volts (will rewind for any standard voltage)
300 KW G.E. HCC6-275 v. DC 1200 RPM #4006753 with 3-100 KVA G.E. Transformers Type H-J-K, 2300/4000 volts.
300 KW Westgh. 275 v. DC 1200 RPM #2222651 with 330 KVA 4160 v. 3 ph. Transformer.

MOTORS, A.C. & D.C. ANY SIZE
TRANSFORMERS, ANY SIZE.

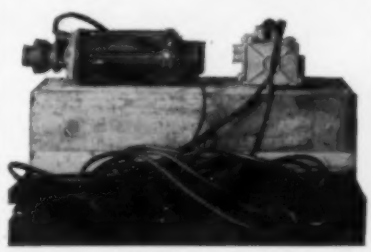
MOORHEAD ELECTRICAL MACHINERY CO.
OAKDALE, PA. PHONE OWENS 3-6401

COAL AUGER FOR SALE

McCarthy Coal Auger Drill,
GMC Diesel—Hydraulic Jacks
24" Head—120' Augers
20" Head—100' Augers
New Style—Drills to bottom of coal
Worked 75 hrs.—New Condition

FRANK SWABB EQUIPMENT CO., INC.
313 Hazleton Nat'l. Bank Bldg.
Hazleton, Pa. GLadstone 5-3658

New Peerless Portable SUBMERSIBLE PUMPS



PUMP RATINGS: 120 GPM @ 63' total head; 200 GPM @ 47' total head; shut-off pressure 87' total head. MOTOR RATINGS: 4 HP, either 115 or 230 volts DC. Compound wound, class "A" insulation, constant speed, continuous duty, water cooled. Full load speed 3200 RPM. Between pump and controller, 115 volt models have 30' of 4-conductor type FCOP-23 cable, and 230 volt models have 45' of 3-conductor type TCOP-23 cable.
WEIGHTS: Pump, motor and strainer—120 lbs. net. Shipping weight of complete pump—180 lbs.

THE BOSTON METALS CO.
313 E. Baltimore Street
Baltimore 2, Md.
Curtis 7-5050

BONDED EQUIPMENT BARGAINS

WRITE, WIRE OR PHONE - IMMEDIATE SHIPMENT FROM OUR FACTORY

NEW BONDED® HEAVY DUTY VIBRATING SCREENS

"For Continuous, Economical Screening of High Tonnages"

More than 5000 mines and quarries have modernized with Bonded equipment

For coal, mineral, chemical and other industrial products. Fast, efficient and economical for cleaning, sizing, grading, dewatering. Made in all metals including stainless steel. Enclosed models for hot materials or dust control. Bonded screens are built for any screening operation, wet or dry.

HEAVY DUTY MODELS: 4-bearing, positive throw, eccentric shaft; 3'x8' to 5'x14' 1 to 5 decks.
TYPE A SCREENS: eccentric weight mechanism, spring mounted, 1 to 3 decks, 2'x4' to 3'x8'.

Heavy Duty Screens from $1095.00 **General Purpose Screens from $395.00**

NEW BONDED® TROUGHING IDLER CONVEYOR BARGAINS

Complete Ready-Fab sections quickly and easily joined together on the job. We take our loss on our stock of short length belting. You can save as much as 50% on the **BONDED CONVEYOR SPECIALS** listed, with conveyor belting in two pieces. Conveyors are equipped with 5" roll diam. idlers and return rolls, 20" diam. head pulley and 16" diam. tail pulley mounted on 2¼" or 2-7/16" diam. shaft. Belt is new 4-ply, 28-oz. duck, ⅛" top rubber cover x 1/32" bottom cover and is fresh stock made by leading manufacturers.

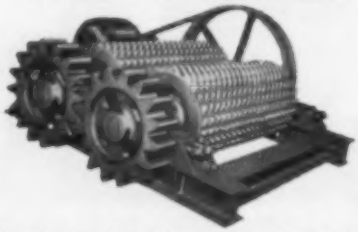
Remember, You Save Up To 50%

CONVEYOR PRICES INCLUDE BELTING

Belt Width	Length of Conveyor	List Price	Sale Price
18"	25'	1229	$ 684
18"	45'	1839	1005
18"	60'	2384	1254
18"	100'	3704	1912
20"	25'	1265	713
20"	45'	1965	1060
20"	60'	2490	1320
24"	25'	1322	773
24"	45'	2062	1145
24"	60'	2617	1426
24"	100'	4097	2166
30"	25'	1421	847
30"	65'	3101	1718
30"	85'	3731	2144

Other lengths and belt width at bargain prices.

NEW BONDED® COAL CRUSHERS

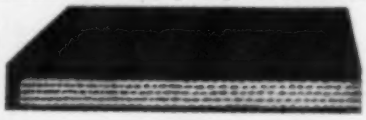


Capacities from 20 to 500 tons per hour. Will crush to all sizes from stoker to 8". Take feed sizes to 24". Teeth designed to break coal sharp and clean with accurate sizing and minimum of fines. Double roll crushers with single and double drive; also single roll crushers. Hard cast rolls and gear, spring safety for tramp iron protection. Same model with corrugated and smooth rolls for cinders, chemicals, ag-lime, shells, etc. Complete with welded steel hoppers.

Priced from **$479.00**

NEW CONVEYOR BELTING SAVE UP TO 28%

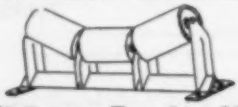
Heavy duty 4-ply, 28 oz. duck, ¼" top rubber cover x 1/32" bottom cover rubber belting having high tensile strength, tough cotton duck, strong carcass and proper flexibility. For heavy boxes, bags and bulk materials. Troughs easily. Famous brands at deep cut prices. Fresh stock.



18"	4.03 foot	2.90 foot
20"	4.42 foot	3.35 foot
24"	5.23 foot	3.76 foot
30"	6.39 foot	4.60 foot

Additional widths and plies available at low prices. Write for free sample.

NEW IDLERS AND RETURN ROLLS 25% BELOW LIST PRICE



3-roll, 5" diameter Troughing Idlers for

14" Belt..	$16.50	24" Belt..	$18.75
16" Belt..	17.25	30" Belt..	19.50
18" Belt..	18.00	36" Belt..	20.25
20" Belt..	18.25	48" Belt..	21.75

1-roll, 5" diameter Return Idlers for

14" Belt..	$ 6.38	24" Belt..	$ 7.50
16" Belt..	6.75	30" Belt..	8.25
18" Belt..	7.13	36" Belt..	8.75
20" Belt..	7.30	48" Belt..	10.25

All steel. Interchangeable with other well-known makes. Replaceable ball bearings. Either sealed type (pre-lubricated) or with alemite fittings. Rust proof ball races. Maintenance is negligible.

BONDED CONVEYOR ACCESSORIES

Holdback $90.00 — Guide Idler $13.75 — Wing Pulley $74.00

Visit the Bonded factory any time and see Bonded machines being built and tested. Consult our engineers without obligation. Write for Free catalog and prices.

BONDED SCALE & MACHINE CO.

2190 S. THIRD, COLUMBUS 7, OHIO—PHONES: Hickory 4-2186; FRanklin 6-8898, Evenings

Mfgrs. of Scales, Conveyors, Conveyor Parts, Idlers, Vibrating Screens, Crushers and Feeders

SHOVELS—DRAGLINES ROTARY DRILLS

190-B Bucyrus Erie 8 yard electric shovel. Like new.
1600 P & H 6 yard electric shovel.
2400 Lima 6 yard diesel shovel.
1400 P & H 4 yard electric shovel.
111-M Marion 3½ yard diesel shovel.
4161 Marion 5 yard electric shovel. Worked about three years.
1201 Lima Hi-Lift Diesel Shovel 42' boom, 32' stick, 2½ yard dipper.
3500 Manitowoc Hi-Lift Diesel Shovel 45' boom, 35' stick, 2 yard dipper.
111-M Marion Hi-Lift Diesel Shovel 43' boom, 34' stick, 3 yard dipper.
40-A Marion Hi-Lift Diesel Shovel 45' boom, 34' stick, 2½ yard dipper.
450-W Bucyrus Erie diesel dragline 165' boom, 13 yard bucket.
625 Page diesel dragline 150' boom, 9 yard bucket.
621 Page diesel dragline 130' boom, 5 yard bucket.
5W Bucyrus Erie diesel dragline 125' boom, 5 yard bucket.
2400 Lima diesel dragline 130' boom, 5 yard bucket.
4500 Manitowoc diesel dragline 120' boom, 5 yard bucket.
1055 P & H diesel dragline 80' boom, 4 yard bucket.
1201 Lima diesel dragline 85' boom, 3 yard bucket. Independent boom hoist.
3500 Manitowoc diesel dragline 85' boom, 2½ yard bucket.
955 P & H diesel dragline 85' boom, 2½ yard bucket.

ALSO MANY SMALLER SHOVELS AND DRAGLINES

Reich Truck Mounted Rotary Air Drill.
58-BH Joy Champion Rotary Air Drill.
56-BH Joy Middle Weight Rotary Air Drill.

ALSO 42T, 29T, AND 27T WELL DRILLS

FRANK SWABB EQUIPMENT CO., INC.

313 Hazleton Nat'l. Bank Bldg.
Hazleton, Pa. GLadstone 5-3658

BRONZE GEAR TYPE BILGE PUMP

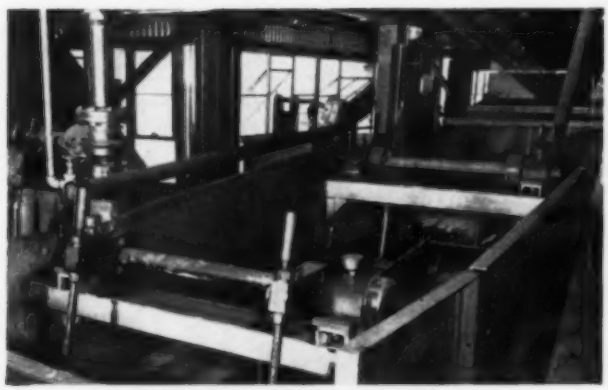
Mfg. by Oberdorfer, size 1¼" single lower drive shaft, bronze construction, stainless steel shaft, self-priming. Price: $26.50.

THE BOSTON METALS CO.

313 E. Baltimore Street
Baltimore 2, Md.

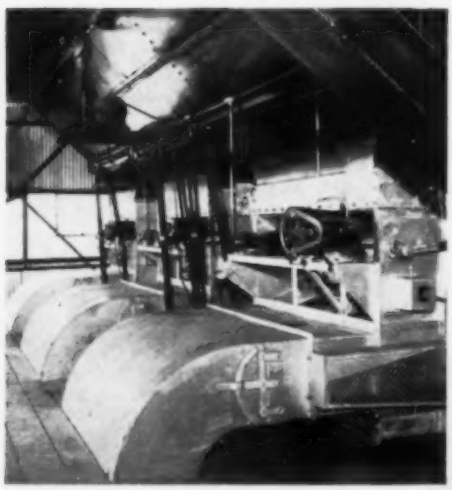
FOR SALE
MODERN COAL PREPARATION PLANT

5 Track — 400 tons per hour cleaning plant



Two Cell Hydroseparator

This comparatively new combination wet and dry coal cleaning plant is located at Herrin, Illinois. It is in excellent condition and can be seen in operation.



Feed end of Airflow units

The tipple is served by railroad cars through a 50 ton bin and a hoist shaft through a 100 ton bin. Each of these bins has a feeder to load a belt conveyor for elevating the coal to the top of the cleaning plant.

After picking, crushing, and screening, the 6" x 1½" is wet cleaned and the 1½" x 10 M is pneumatically cleaned. After cleaning, the crushing and screening facilities can convert the entire product into stoker coal or any other size or combination of sizes within the entire range from 6" egg to slack.

Complete details are immediately available describing this plant. Address your inquiries to:

FREEMAN COAL MINING CORPORATION
300 W. Washington Street, Chicago 6, Illinois

There is no MAGIC in the Machinery Business

BECAUSE of our Fair Dealings with the public.

J. T. FISH & COMPANY, sells the Most Mining Equipment and at reasonable prices Always.

We Own What We Advertise—

All types of Joy Cutters, Loaders, Shuttle Cars, Cat Trucks, Belt Conveyors, Chain Conveyors, etc. Includes

JOY EQUIPMENT—rebuilt

1—Joy 11RU rubber tired cutter.
1—Joy 12BU, 9E Loader, 26" ht. Rebuilt.
1—Joy 12BU, 7E Loader, bargain.
1—Joy 14BU, low pedestal Loader, 38V head motors.
1—Joy 14BU, 7BE Loader, 10 H.P. head motors.
5—Joy 14BU, 7CE Loaders, 10 H.P. motors.
3—Joy 8BU, type 11E, Loaders.
1—Joy 3 JCM Continuous Miner, 34" ht.
4—Joy 32E9 Shuttle Cars.
2—Joy 32D Battery Cars.
1—Joy 58C Battery Shuttle Cars.
4—Joy 58C Shuttle Cars, 250 volt DC.
4—Joy 65C four wheel drive Shuttle Cars.
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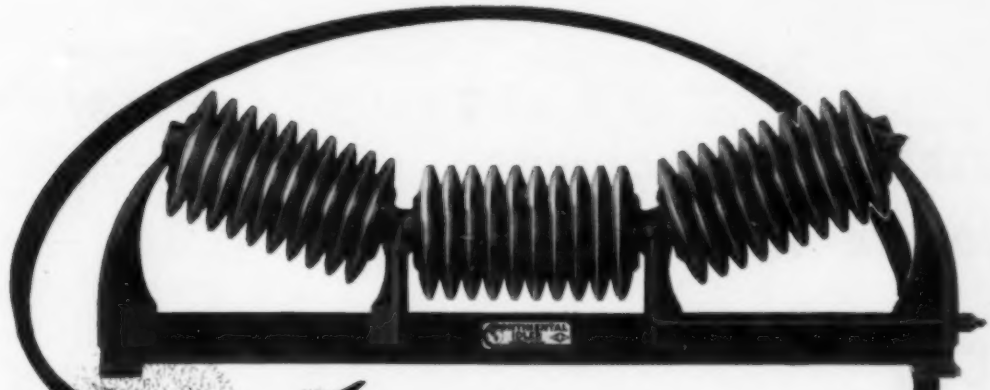

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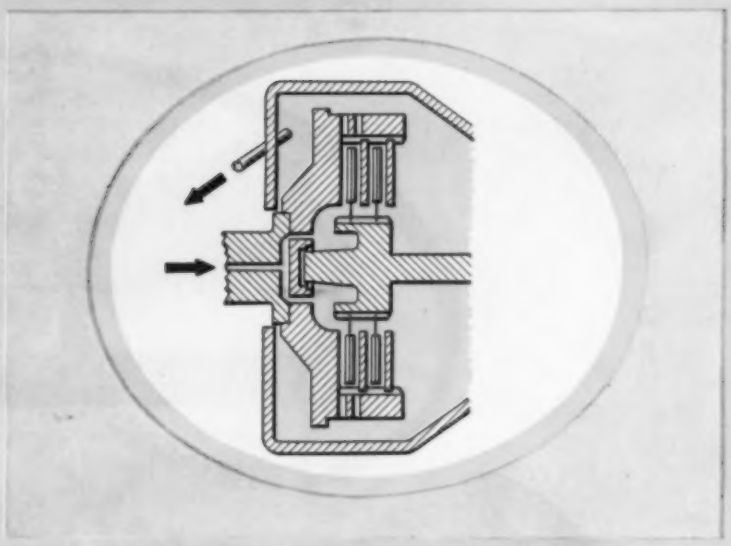
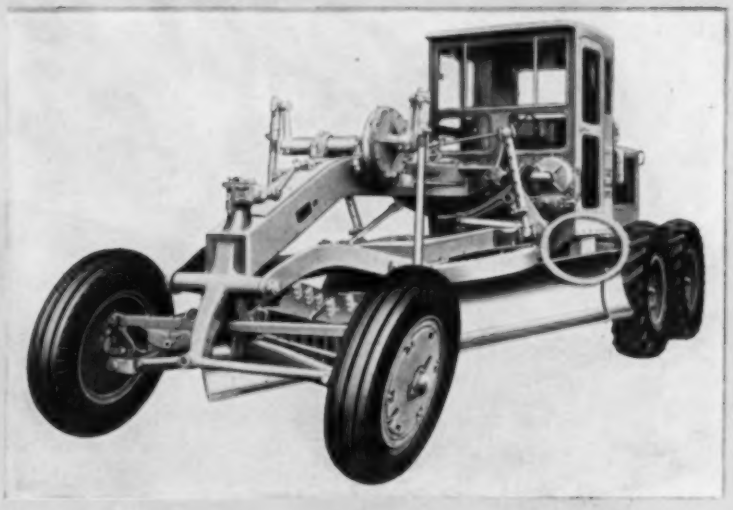


Arrows show path of oil through housing with clutch disengaged. Facings remain cool and bathed in oil, which is carried to outlet at top by flywheel ring gear. The two steel clutch discs and clutch brake are faced with pressure-processed cork, which gives an excellent coefficiency of friction and long wear.



The new oil clutch for the No. 12 Motor Grader gives you the same reliability and improved performance as the thoroughly job-proved oil clutch in Caterpillar track-type Tractors. Rugged and reliable, it uses oil from the engine lubrication system. Here are some of the things the new oil clutch for the CAT* No. 12 can mean to *you:*

LONGER WORK LIFE—In actual on-the-job tests, clutch facings wear less than the thickness of a human hair in one thousand hours' operation! Thick clutch facings mean that work life is extended thousands of hours before discs need be replaced. And constant "oil bath" lubrication reduces wear on all moving parts.

LESS MAINTENANCE—Adjustment every 1500 hours is not unusual, after initial "break in." This is equivalent to nearly nine months without adjustment on road maintenance work! No external lubrication is needed: internal oil system lubricates pilot and throwout bearings.

GREATER EFFICIENCY—The clutch is constantly cooled, never exceeding normal engine oil temperature. This practically eliminates clutch fade, greatly reduces slippage due to overheating, and means that the clutch retains "like new" operation for thousands of hours.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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99% OF ALL CAT MOTOR GRADERS ARE STILL IN USE

Rugged Work and a hose to match!

U. S. 4810 Air Hose

Jagged rocks, grinding gravel, severe cold and sun checking, punishing impacts from heavy equipment—all these were faced *and licked* by the "U. S." engineers who designed U. S. 4810. Reason enough why it's become one of the most popular of all hose for mines, quarries, shipyards and general construction work.

Combining super adhesion, great strength, high resistance to cuts and abrasion, and extreme *flexibility,* U. S. 4810 is recommended for all pneumatic tools and air drills, for use *wherever* high working pressures, abrasion, and general abuse pose problems.

Service-packed, economical U. S. 4810 Air Hose is available from any of our 27 District Sales Offices, or by writing to the address below. *Whatever* your hose requirements, you'll find it pays to turn to "U. S." There's a job-engineered U. S. Hose for practically every purpose – an expert staff of "U. S." Engineers to assist you with your hose selection.

- tough, flexible tube of neoprene provides top oil resistance
- high-tenacity, tire-type cable rayon braids give tremendous carcass strength
- thick cover of cut-resistant natural rubber wards off damage from rocks, tools, and equipment

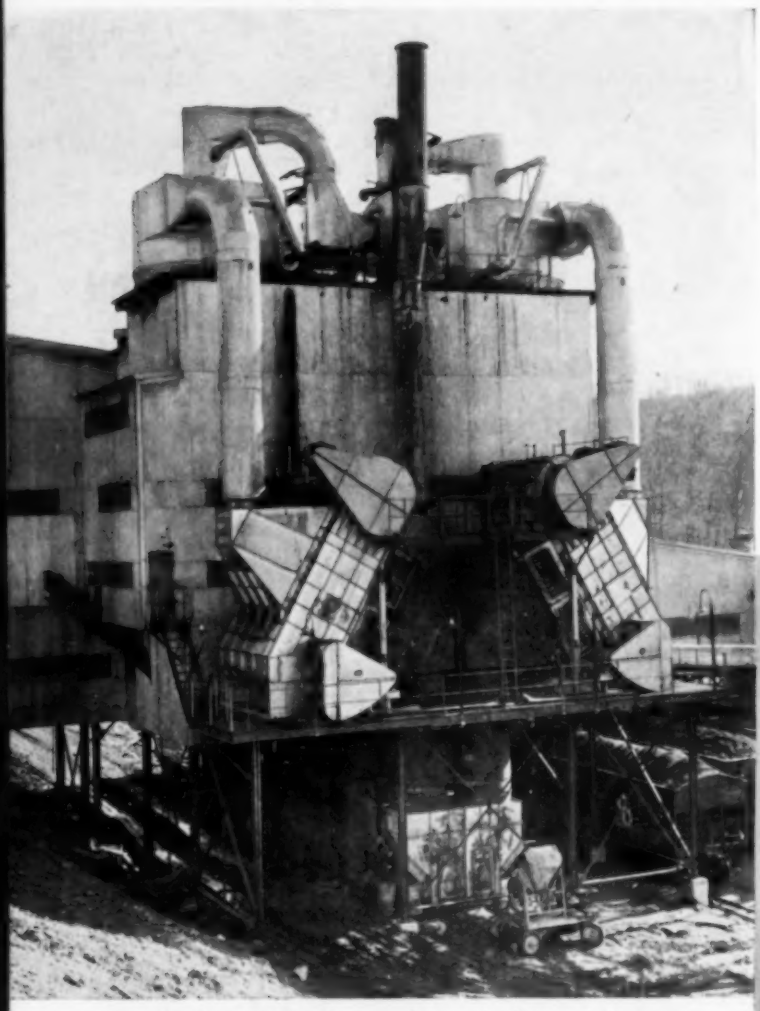
"U.S." Research perfects it..."U.S." Production builds it... U.S. Industry depends on it.

UNITED STATES RUBBER COMPANY

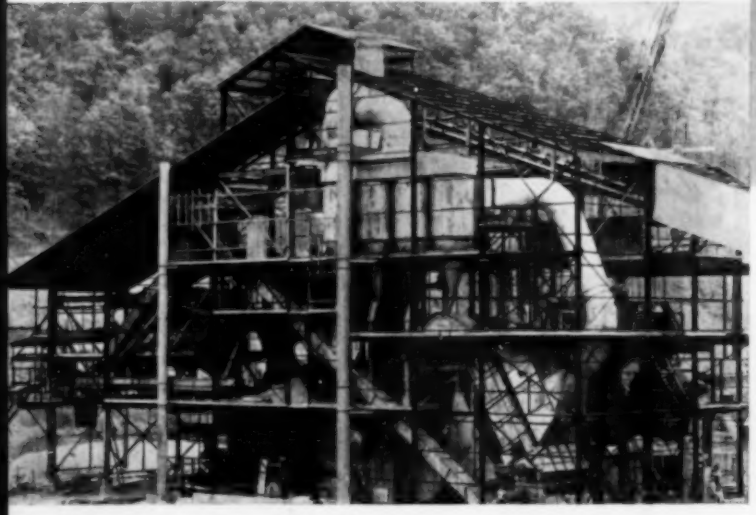
MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

Coal operators order and re-order LINK-BELT Multi-Louvre Dryers



Lower maintenance costs result from the simple design of these two Link-Belt Multi-Louvre Dryers at a West Virginia mine.

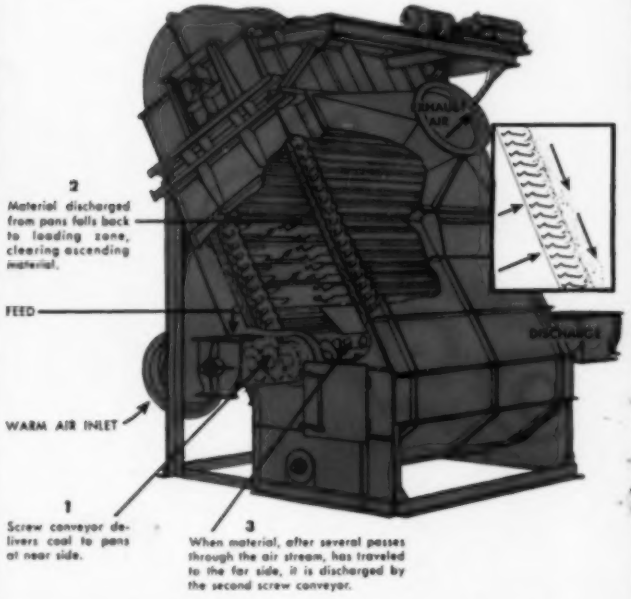


Lower temperatures possible with Multi-Louvre Dryers like this one at a Kentucky mine assure adequate moisture reduction.

Yes, they're No. 1 choice for fast, safe, low-cost drying of 1½- to 0-inch coal

OF more than 40 Link-Belt Multi-Louvre Dryers now operating in preparation plants, the majority are repeat orders. And there's good reason for this continuing popularity. Special design minimizes air pressure drop . . . cuts power consumption and cost—*often as much as 50%*. And low air velocity reduces degradation and dusting . . . makes dust collection easy.

Just as important are the Multi-Louvre Dryer's accurate automatic controls that vary the feed rate and maintain low air intake temperatures, thus preventing oxidation . . . insuring uniform moisture reduction. For more complete information on how the Link-Belt Multi-Louvre Dryer can help you produce a better, more marketable product, call your nearby Link-Belt office. Or write for Book 2466.


2
Material discharged from pans falls back to loading zone, clearing ascending material.
FEED
WARM AIR INLET
1
Screw conveyor delivers coal to pans at near side.
3
When material, after several passes through the air stream, has traveled to the far side, it is discharged by the second screw conveyor.

Maximum heat transfer—Louvre pan action spreads coal in thin layers . . . directs air currents through moving curtain of material for highest operating efficiency.

LINK-BELT

13,011

MULTI-LOUVRE DRYERS

LINK-BELT COMPANY: Chicago 9, Birmingham 3, Cleveland 15, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 2, Pittsburgh 13, Seattle 4, St. Louis 1, Scarboro (Toronto 13), Springs (South Africa).